| | Type | L # | Hits | Search Text | DBs | Time Stamp | Comments |
|---|---|---|---|---|---|---|---|
| 1 | BRS | L1 | 2 | "4645831".pn. "3463770".pn. | USPAT | 2005/08/18 14:23 | |
| 2 | BRS | L2 | 5356 | gluten and (extract$ or isolat$ or purifi$) | US-PGPUB; USPAT; EPO; JPO; DERWENT | 2005/08/18 14:26 | |
| 3 | BRS | L4 | 3412 | L2 and (machine or mechanical or cutting blade or perforated plate) | US-PGPUB; USPAT; EPO; JPO; DERWENT | 2005/08/18 14:30 | |
| 4 | BRS | L5 | 1580 | L4 and (emulsif$ or agglomerat$) | US-PGPUB; USPAT; EPO; JPO; DERWENT | 2005/08/18 14:35 | |



10/757246

EAST Search History

| | Type | L # | Hits | Search Text | DBs | Time Stamp | Comments |
|---|---|---|---|---|---|---|---|
| 5 | BRS | L6 | 128640 | separation and (gluten or starch or protein) | US-PGPUB; USPAT; EPO; JPO; DERWENT | 2005/08/18 14:37 | |
| 6 | BRS | L7 | 1290 | L6 and (wheat adj flour) | US-PGPUB; USPAT; EPO; JPO; DERWENT | 2005/08/18 14:38 | |
| 7 | BRS | L9 | 203 | L5 and L7 | US-PGPUB; USPAT; EPO; JPO; DERWENT | 2005/08/18 14:43 | |

US-PAT-NO: 5885819

DOCUMENT-IDENTIFIER: US 5885819 A
**See image for Certificate of Correction**

TITLE: Enzyme with xylanase activity

DATE-ISSUED: March 23, 1999


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Kofod; Lene Venke | Ugerloese | N/A | N/A | DK |
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| Christgau; Stephan | Vedbaek | N/A | N/A | DK |
| Heldt-Hansen; Hans Peter | Virum | N/A | N/A | DK |
| Dalb.o slashed.ge; Henrik | Esbjerg | N/A | N/A | DK |
| Andersen; Lene Nonboe | Birker.o slashed.d | N/A | N/A | DK |
| Si; Joan Qi | Klampenborg | N/A | N/A | DK |
| Jacobsen; Tina Sejersg.ang.rd | Copenhagen | N/A | N/A | DK |
| Munk; Niels | Frederiksberg | N/A | N/A | DK |
| Mullertz; Anette | Charlottenlund | N/A | N/A | DK |



US-CL-CURRENT: 435/200, 435/252.3 , 435/254.11 , 435/254.2 , 435/254.3 , 435/320.1 , 536/23.2 , 536/23.74



ABSTRACT:

An enzyme exhibiting xylanase activity, which enzyme is immunologically reactive with an antibody raised against a purified xylanase derived from Aspergillus aculeatus, CBS 101.43. The enzyme may be used for degrading plant cell wall components e.g. in the preparation of feed, in baking, in the paper and pulp industry and in connection with separation of wheat into starch and gluten.


44 Claims, 10 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 10

CLAIMS:

What is claimed is:

1. A DNA construct which comprises a DNA sequence encoding an enzyme having xylanase activity as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-birch xylan, and which DNA sequence hybridizes to a DNA depicted in SEQ ID NO. 5 under the following conditions: hybridizing in 5.times. SSC, 5.times. Denhardt's solution, 0.5% SDS and 100 .mu.g/ml salmon sperm DNA for 16 hrs. at about 65.degree. C. followed by washes in 5.times. SSC at 65.degree. C., 2.times. SSC, 0.5% SDS, 0.2.times. SSC, 0.5% SDS and 5.times. SSC.

2. The DNA construct of claim 1, in which the enzyme encoded by the DNA sequence is derived from an Aspergillus species.

3. The DNA construct of claim 1, in which the enzyme encoded by the DNA sequence is derived from Aspergillus aculeatus.

4. The DNA construct of claim 1, in which the DNA sequence is isolated from a DNA library of Aspergillus aculeatus, CBS 101.43.

5. A recombinant expression vector comprising the DNA construct of claim 1.

6. A cell comprising the recombinant expression vector of claim 5.

7. The cell according to claim 6, in which the cell is a eukaryotic cell.

8. The cell according to claim 6, in which the cell is a fUngal cell.

9. The cell according to claim 6, in which the cell is a yeast cell or filamentous fungal cell.

10. The cell according to claim 6, in which the cell belongs to a strain of Aspergillus.

11. The cell according to claim 6, in which the cell belongs to a strain of Aspergillus niger or Aspergillus oryzae.

12. A method for producing an enzyme exhibiting xylanase activity comprising culturing the cell of claim 6 under conditions permitting the production of the enzyme and recovering the enzyme from the culture.

13. A DNA construct which comprises a DNA sequence encoding an enzyme having sylanase activity depicted in SEQ ID NO:6 or mutant thereof having the same xylanase activity as the xylanase depicted in SEQ ID NO. 6 as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-birch xylan, said said mutant also having a pH optimum of 5-6 and a temperature optimum of 40.degree.-50.degree. C.

14. The DNA construct of claim 13, in which the enzyme encoded by the DNA sequence is derived from an Aspergillus species.

15. The DNA construct of claim 13, in which the enzyme encoded by the DNA sequence is derived from Aspergillus aculeatus.

16. The DNA construct of claim 13, in which the DNA sequence is isolated from a DNA library of Aspergillus aculeatus, CBS 101.43.

17. A recombinant expression vector comprising the DNA construct of claim 13.

18. A cell comprising the recombinant expression vector of claim 17.

19. The cell according to claim 18, in which the cell is a eukaryotic cell.

20. The cell according to claim 19, in which the cell is a fungal cell.

21. The cell according to claim 19, in which the cell is a yeast cell or filamentous fungal cell.

22. The cell according to claim 19, in which the cell belongs to a strain of Aspergilus.

23. The cell according to claim 19, in which the cell belongs to a strain of Aspergillus niger or Aspergillus oryzae.

24. A method for producing an enzyme exhibiting xylanase activity comprising culturing the cell of claim 19 under conditions permitting the production of the enzyme and recovering the enzyme from the culture.

25. A DNA construct which comprises a DNA sequence derived from Aspergillus aculeatus encoding an enzyme having xylanase activity as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-birch xylan, said enzyme having a pH optimum of 4-5 and at a temperature range of 70.degree.-80.degree. C. and in which said enzyme is encoded by a DNA sequence comprising the partial DNA sequence depicted in SEQ ID NO. 41.

26. The DNA construct of claim 25, in which the DNA sequence is isolated from a DNA library of Aspergillus aculeatus, CBS 101.43.

27. A recombinant expression vector comprising the DNA construct of claim 25.

28. A cell comprising the recombinant expression vector of claim 27.

29. The cell according to claim 28, in which the cell is a eukaryotic cell.

30. The cell according to claim 28, in which the cell is a fungal cell.

31. The cell according to claim 28, in which the cell is a yeast cell or filamentous fungal cell.

32. The cell according to claim 28, in which the cell belongs to a strain of Aspergillus.

33. The cell according to claim 28, in which the cell belongs to a strain of Aspergillus niger or Aspergillus oryzae.

34. A method for producing an enzyme exhibiting xylanase activity comprising culturing the cell of claim 28 under conditions permitting the production of the enzyme and recovering the enzyme from the culture.

35. A DNA construct which comprises a DNA sequence derived from Aspergillus aculeatus encoding an enzyme having xylanase activity as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-birch xylan, said enzyme having a pH optimum of 5-6 and at a temperature range of 40.degree.-50.degree. C. and in which said enzyme is encoded by a DNA sequence comprising the partial DNA sequence depicted in SEQ ID NO. 42.

36. The DNA construct of claim 35, in which the DNA sequence is isolated from a DNA library of Aspergillus aculeatus, CBS 101.43.

37. A recombinant expression vector comprising the DNA construct of claim 35.

38. A cell comprising the recombinant expression vector of claim 37.

39. The cell according to claim 38, in which the cell is a eukaryotic cell.

40. The cell according to claim 38, in which the cell is a fungal cell.

41. The cell according to claim 38, in which the cell is a yeast cell or filamentous fungal cell.

42. The cell according to claim 38, in which the cell belongs to a strain

of Aspergillus.

43. The cell according to claim 38, in which the cell belongs to a strain of Aspergillus niger or Aspergillus oryzae.

44. A method for producing an enzyme exhibiting xylanase activity comprising culturing the cell of claim 38 under conditions permitting the production of the enzyme and recovering the enzyme from the culture.

US-PAT-NO: 6080567

DOCUMENT-IDENTIFIER: US 6080567 A

TITLE: Enzymes with xylanase activity from Aspergillus aculeatus

DATE-ISSUED: June 27, 2000


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
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| Kauppinen; Markus Sakari | Copenhagen | N/A | N/A | DK |
| Christgau; Stephan | Vedbaek | N/A | N/A | DK |
| Heldt-Hansen; Hans Peter | Virum | N/A | N/A | DK |
| Dalb.o slashed.ge; Henrik | Esbjerg | N/A | N/A | DK |
| Andersen; Lene Nonboe | Birker.o slashed.d | N/A | N/A | DK |
| Si; Joan Qi | Klampenborg | N/A | N/A | DK |
| Jacobsen; Tina Sejersg.ang.rd | Copenhagen | N/A | N/A | DK |
| Munk; Niels | Frederiksberg | N/A | N/A | DK |
| Mullertz; Anette | Charlottenlund | N/A | N/A | DK |



US-CL-CURRENT: 435/200, 435/252.33 , 435/254.1 , 435/254.2 , 435/254.3 , 536/23.2



ABSTRACT:

An enzyme exhibiting xylanase activity, which enzyme is immunologically reactive with antibody raised against a purified xylanase derived from Aspergillus aculeatus, CBS 101.43. The enzyme may be used for degrading plant cell wall components, e.g., in the preparation of feed, in baking, in the paper and pulp industry, and in connection with separation of wheat into starch and gluten.


37 Claims, 10 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 10

CLAIMS:

What is claimed is:

1. An essentially pure enzyme having xylanase activity, as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-Birch xylan, said enzyme having a pH optimum of 6-7 and a temperature optimum of 30-50.degree. C. and which DNA sequence hybridizes to a DNA sequence depicted in SEQ ID NO. 1 under the following conditions: hybridizing in 5.times. SSC, 5.times. Denhardt's solution, 0.5% SDS, and 50 .mu.g/ml salmon sperm DNA for 16 hrs at about 65.degree. C followed by washes in 5.times. SSC, 2.times. SSC, 0.5% SDS, 0.2.times. SSC, 0.5% SDS and 5.times. SSC at 65.degree. C.

2. The essentially pure enzyme of claim 1 having a molecular weight of 32 kDa as determined by SDS PAGE.

3. The essentially pure enzyme of claim 1 having an apparent pI of 8.8.

4. The essentially pure enzyme of claim 1 which is derivable from a filamentous fungus or a yeast.

5. The essentially pure enzyme of claim 1 which is derivable from a fungal strain of Aspergillus, Trichoderma, Penicillium, Pusarium or Humicola.

6. The essentially pure enzyme of claim 1 which is derivable from a strain of Aspergillus aculeatus, Aspergillus niger or Aspergillus oryzae.

7. The essentially pure enzyme of claim 1 which is encoded by a DNA sequence isolated from a DNA library of Aspergillus aculeatus, CBS 101.43.

8. An enzyme preparation useful for the degradation of plant cell wall components, comprising the xylanase of claim 1.

9. The preparation according to claim 8, which additionally comprises a pectin lyase, pectate lyase, glucanase, xylosidase, arabinosidase, xylan acetyl esterase, or pectin methyl esterase.

10. An essentially pure enzyme derivable from Aspergillus aculeatus having xylanase activity, as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-Birch xylan, said enzyme having a pH optimum of 4-5 and a temperature optimum of 70-80.degree. C. and is encoded by a DNA sequence which hybridizes to a DNA sequence depicted in SEQ ID NO. 3 under the following conditions: hybridizing in 5.times. SSC, 5.times. Denhardt's solution, 50 mM sodium phosphate, pH 6.8 and 50 .mu.g denatured sonicated calf thymus DNA for 18 hrs at about 40.degree. C. followed by washing three times in 2.times. SSC, 0.2% SDS at 40.degree. C. for 30 minutes.

11. The essentially pure enzyme of clam 10 which is encoded by a DNA sequence isolated from a DNA library of Aspergillus aculeatus, CBS 101.43.

12. An enzyme preparation useful for the degradation of plant cell wall components, comprising the xylanase of claim 10.

13. The preparation according to claim 12, which additionally comprises a pectin lyase, pectate lyase, glucanase, xylosidase, arabinosidase xylan acetyl esterase, or pectin methyl esterase.

14. An essentially pure enzyme derivable from Aspergillus having xylanase activity, as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-Birch xylan, said enzyme having a pH optimum of 4-5 and a temperature optimum of 70-80.degree. C. and is

encoded by a DNA sequence comprising the partial DNA sequence depicted in SEQ ID NO. 41.

15. The essentially pure enzyme of claim 14 having a molecular weight of 56 kDa as determined by SDS PAGE.

16. The essentially pure enzyme of claim 14 having an apparent pI of 4.5-4.7.

17. The essentially pure enzyme of claim 14 which is derivable from a filamentous fungus or a yeast.

18. The essentially pure enzyme of claim 14 which is derivable from a strain of Aspergillus aculeatus, Aspergillus niger or Aspergillus oryzae.

19. The essentially pure enzyme of claim 14 which is encoded by a DNA sequence isolated from a DNA library of Aspergillus aculeatus, CBS 101.43.

20. An enzyme preparation useful for the degradation of plant cell wall components, comprising the xylanase of claim 14.

21. The preparation according to claim 20, which additionally comprises a pectin Lyase, pectate lyase, glucanase, xylosidase, arabinosidase, xylan acetyl esterase, or pectin methyl esterase.

22. An essentially pure enzyme having xylanase activity, as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-Birch xylan, said enzyme having a pH optimum of 5-6 and a temperature optimum of 40-50.degree. C. and which DNA sequence hybridizes to a DNA sequence depicted in SEQ ID NO. 5 under the following conditions: hybridizing in 5.times. SSC, 5.times. Denhardt's solution, 0.5% SDS, and 50 .mu.g/ml salmon sperm DNA for 16 hrs at about 65.degree. C. followed by washes in 5.times. SSC, 2.times. SSC, 0.5% SDS, 0.2.times. SSC, 0.5% SDS and 5.times. SSC at 65.degree. C.

23. The essentially pure enzyme of claim 22 having a molecular weight of 24.8 kDa as determined by SDS PAGE.

24. The essentially pure enzyme of claim 22 having an apparent pI of 5.7.

25. The essentially pure enzyme of claim 22 which is derivable from a filamentous fungus or a yeast.

26. An enzyme preparation useful for the degradation of plant cell wall components, comprising xylanase of claim 22.

27. The preparation according to claim 26, which additionally comprises a pectin lyase, pectate lyase, glucanase, xylosidase, arabinosidase, xylan acetyl esterase, or pectin methyl esterase.

28. The essentially pure enzyme of claim 22 which is derivable from a fungal strain of Aspergillus, Trichoderma, Penicillium, Fusarium or Humicola.

29. The essentially pure enzyme of claim 22 which is derivable from a strain of Aspergillus aculeatus, Aspergillus niger or Aspergillus oryzae.

30. The essentially pure enzyme of claim 22 which is encoded by a DNA sequence isolated from a DNA library of Aspergillus aculeatus, CBS 101.43.

31. An essentially pure enzyme derivable from Aspergillus having xylanase activity, as measured by release of reducing sugars from birch xylan or by release of blue color from AZCL-Birch xylan, said enzyme having a pH optimum of 5-6 and a temperature optimum of 40-50.degree. C. and is encoded by a DNA sequence comprising the partial DNA sequence depicted in SEQ ID NO. 42.

32. The essentially pure enzyme of claim 31 having a molecular weight of 24.8 kDa as determined by SDS PAGE.

33. The essentially pure enzyme of claim 31 having an apparent pI of 5.7.

34. The essentially pure enzyme of claim 31 which is derivable from a strain of Aspergillus aculeatus, Aspergillus niger or Aspergillus oryzae.

35. The essentially pure enzyme of claim 31 which is encoded by a DNA sequence **isolated** from a DNA library of Aspergillus aculeatus, CBS 101.43.

36. An enzyme preparation useful for the degradation of plant cell wall components, comprising the xylanase of claim 31.

37. The preparation according to claim 36, which additionally comprises a pectin lyase, pectate lyase, glucanase, xylosidase, arabinosidase, xylan acetyl esterase, or pectin methyl esterase.

No good date

PGPUB-DOCUMENT-NUMBER: 20030026888

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030026888 A1

TITLE: Process for the deagglomeration and the homogeneous dispersion of starch particles

PUBLICATION-DATE: February 6, 2003

INVENTOR-INFORMATION:

| NAME | CITY | STATE | COUNTRY | RULE-47 |
|---|---|---|---|---|
| Guraya, Harmeet S. | New Orleans | LA | US | |

US-CL-CURRENT: 426/622

ABSTRACT:

prefer

Slurries of amylaceous flour from milled seed of cereals, beans, and legumes containing dispersed particles of starch-protein agglomerates are subjected to high pressure processing to obtain deagglomerated starch granules and protein. Further treatment of the deagglomerated product leads to the recovery of a novel protein-coated starch product or to the isolation of starch and protein of high purity and quality. The method greatly improves the recovery of starch during classification/separation from protein and is therefore economical. Starch reduced to individual granules, with low starch damage, low protein content, and with improved pasting characteristics, can be produced using this deagglomerization method. The protein obtained by the process has better solubility and is therefore suitable for beverage applications.

CLAIMS:

We claim:

1. A method for processing an amylaceous flour, said method comprising: a. providing an aqueous slurry of an amylaceous flour comprising starch-protein and starch-starch agglomerates; b. subjecting said slurry to conditions of shear, cavitation and impact; and c. obtaining a slurry comprising deagglomerated starch granules and protein.

2. The method of claim 1, wherein said conditions of shear, cavitation and impact are imparted by microfluidization.

3. The method of claim 1, wherein said impact is imparted by converging two streams of said slurry.

4. The method of claim 1, wherein said impact is imparted by particle-particle collision.

5. The method of claim 1, wherein step (b) is conducted under high pressure.

6. The method of claim 5, wherein said high pressure is in the range of about 3000-30,000 psi.

7. The method of claim 5 wherein said high pressure is in the range of about 9000-15,000 psi.

8. The method of claim 1, wherein said amylaceous flour is milled seed selected from the group consisting of cereals, beans and legumes.

9. The method of claim 1, wherein said amylaceous flour is milled seed selected from the group consisting of rice, corn, oats, wheat, rye, soybeans, and peas.

10. The method of claim 1, wherein said amylaceous flour is milled rice.

11. The method of claim 1, and further comprising the step of separating said deagglomerated starch granules from said protein.

12. The method of claim 1, and further comprising recovering said starch granules and said protein from said slurry.

13. The method of claim 1, and further comprising the step of drying said deagglomerated starch granules in the presence of protein to promote coating of said starch granules with said protein.

14. The method of claim 13, wherein said drying is spray drying.

15. A product produced by the process of claim 1.

16. A product produced by the process of claim 2.

17. A product produced by the process of claim 3.

18. A product produced by the process of claim 4.

19. A product produced by the process of claim 5.

20. A product produced by the process of claim 6.

21. A product produced by the process of claim 7.

22. A product produced by the process of claim 8.

23. A product produced by the process of claim 9.

24. A product produced by the process of claim 10.

25. A product produced by the process of claim 11.

26. A product produced by the process of claim 12.

27. A product produced by the process of claim 13.

28. A product produced by the process of claim 14.

29. A protein-coated starch product.

30. The protein-coated starch product of claim 29 wherein the starch is rice starch.

PGPUB-DOCUMENT-NUMBER: 20030194467

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20030194467 A1

TITLE: Method of improving the properties of a flour dough, a flour dough improving composition and improved food products

PUBLICATION-DATE: October 16, 2003


INVENTOR-INFORMATION:

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| Soe, Jorn Borch | Tilst | | DK | |
| Poulsen, Charlotte Horsmans | Brabrand | | DK | |
| Hostrup, Pernille Bak | Marslet | | DK | |


US-CL-CURRENT: 426/18


ABSTRACT:

A method of improving the Theological and/or machineability properties of a flour dough and/or the quality of the product made from the dough, comprising adding to the dough a combination comprising a Hox and an emulsifying agent.


CLAIMS:

What is claimed is:

1. A method of improving the Theological and/or machineability properties of a flour dough and/or the quality of the product made from the dough, comprising adding to the dough a combination comprising a Hox and an emulsifying agent.

2. A method according to claim 1 wherein the emulsifying agent is a lipase.

3. A method according to claim 2 wherein the lipase comprises a triacylglycerol lipase, a galactolipase, or a phospholipase.

4. A method according to claim 1 wherein the Hox is isolated from a red algae.

5. A method according to claim 1 wherein the flour dough comprises at least one further dough additive or ingredient.

6. A method according to claim 5 wherein the further dough additive or ingredient is selected from the group consisting of a vegetable oil, a vegetable fat, an animal fat, shortening, butterfat, glycerol and milk fat.

7. A method according to claim 1 wherein the flour dough comprises a hard flour.

8. A method according to claim 1 wherein the product is a bread product.

9. A method according to claim 1 wherein at least one further enzyme is added to the dough ingredients, dough additives or the dough.

10. A method according to claim 9 wherein the further enzyme comprises a xylanase, a cellulase, a hemicellulase, a **starch** degrading enzyme, a protease, a lipoxygenase, an oxidoreductase or a lipase.

11. A dough improving composition comprising a Hox and an **emulsifying** agent.

12. A dough improving composition according to claim 11 wherein the **emulsifying** agent is a lipase.

13. A dough improving composition according to claim 12 wherein the lipase comprises a triacylglycerol lipase, a galactolipase, or a phospholipase.

14. A dough improving composition according to claim 13 wherein the Hox is **isolated** from red algae.

15. A dough improving composition according to claims 11-14 wherein the flour dough comprises at least one further dough additive or ingredient.

16. A dough improving composition according to claim 15 wherein the further dough additive or ingredient comprises a vegetable oil, a vegetable fat, an animal fat, shortening, butterfat, glycerol or milk fat.

17. A dough improving composition according to claim 15 wherein the further dough additive or ingredient is a hard **wheat flour**.

18. A method of preparing a bread product comprising adding a dough improving composition according to claims 11-14 to dough ingredients, dough additives or a dough and baking the dough comprising the dough improving composition to obtain the bread product.

19. A dough improving composition according to claims 11-14 wherein at least one further enzyme is added to the dough ingredients, dough additives or the dough.

20. A dough improving composition according to claim 19 wherein the further enzyme comprises a xylanase, a cellulase, a hemicellulase, a **starch** degrading enzyme, a protease, a lipoxygenase, an oxidoreductase or a lipase.

21. A method of improving the Theological and/or machinability properties of a flour dough comprising adding to the dough a dough improving composition of claim 11.

22. A method of improving the volume of a baked product made from a flour dough comprising adding to the dough a dough improving composition of claim 11.

23. A method of improving the Theological and/or machineability properties of a flour dough and/or the quality of the product made from the dough, comprising adding to the dough a combination comprising a Hox and a triacylglycerol lipase.

24. A method of improving the rheological and/or machineability properties of a flour dough and/or the quality of the product made from the dough, comprising adding to the dough a combination comprising a Hox and a galactolipase.

25. A method of improving the Theological and/or machineability properties of a flour dough and/or the quality of the product made from the dough, comprising adding to the dough a combination comprising a Hox and a phospholipase.

26. A method according to claim 9 wherein the further enzyme comprises a

xylanase, an amylase or a mixture of a xylanase and an amylase.

27. A dough improving composition according to claim 14 wherein the red algae comprises Iridophycus flaccidum, Chondrus crispus, or Euthora cristata.

28. A dough improving composition of claim 19, wherein the further enzyme comprises a xylanase, an amylase or a mixture of a xylanase and an amylase.

29. A method according to claim 4, wherein the red algae comprises Iridophycus flaccidum, Chondrus crispus or Euthora cristata.

US-PAT-NO: 6737099

DOCUMENT-IDENTIFIER: US 6737099 B2

TITLE: Process for the deagglomeration and the homogeneous dispersion of starch particles

DATE-ISSUED: May 18, 2004


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
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| Guraya; Harmeet S. | New Orleans | LA | N/A | N/A |


US-CL-CURRENT: 426/622, 426/656 , 426/93


ABSTRACT:

Pressure

Slurries of amylaceous flour from milled seed of cereals, beans, and legumes containing dispersed particles of starch-protein agglomerates are subjected to high pressure processing to obtain deagglomerated starch granules and protein. Further treatment of the deagglomerated product leads to the recovery of a novel protein-coated starch product or to the isolation of starch and protein of high purity and quality. The method greatly improves the recovery of starch during classification/separation from protein and is therefore economical. Starch reduced to individual granules, with low starch damage, low protein content, and with improved pasting characteristics, can be produced using this deagglomerization method. The protein obtained by the process has better solubility and is therefore suitable for beverage applications.


30 Claims, 30 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 26

CLAIMS:

I claim:

1. A method for processing an amylaceous flour, said method comprising: a. providing an aqueous slurry of an amylaceous flour comprising starch-protein and starch-starch agglomerates; b. subjecting said slurry to conditions of shear, cavitation and impact; and c. obtaining a product comprising minimal starch damage and the homogeneous dispersion of individual starch granules and protein in a liquid matrix.

2. The method of claim 1, wherein said conditions of shear, cavitation and impact are imparted by microfluidization.

3. The method of claim 1, wherein said impact is imparted by converging two streams of said slurry.

4. The method of claim 1, wherein said impact is imparted by particle--particle collision.

5. The method of claim 1, wherein step (b) is conducted under high

pressure.

6. The method of claim 5, wherein said high pressure is in the range of about 3000-30,000 psi.

7. The method of claim 5 wherein said high pressure is in the range of about 9000-15,000 psi.

8. The method of claim 1, wherein said amylaceous flour is milled seed selected from the group consisting of cereals, beans and legumes.

9. The method of claim 1, wherein said amylaceous flour is milled seed selected from the group consisting of rice, corn, oats, wheat, rye, soybeans, and peas.

10. The method of claim 1, wherein said amylaceous flour is milled rice.

11. The method of claim 1, and further comprising the step of separating said deagglomerated starch granules from said protein.

12. The method of claim 1, and further comprising recovering said starch granules and said protein from said slurry.

13. The method of claim 1, and further comprising the step of drying said deagglomerated starch granules in the presence of protein to promote coating of said starch granules with said protein.

14. The method of claim 13, wherein said drying is spray drying.

15. A product produced by the process of claim 1.

16. A product produced by the process of claim 2.

17. A product produced by the process of claim 3.

18. A product produced by the process of claim 4.

19. A product produced by the process of claim 5.

20. A product produced by the process of claim 6.

21. A product produced by the process of claim 7.

22. A product produced by the process of claim 8.

23. A product produced by the process of claim 9.

24. A product produced by the process of claim 10.

25. A product produced by the process of claim 11.

26. A product produced by the process of claim 12.

27. A product produced by the process of claim 13.

28. A product produced by the process of claim 14.

29. A protein-coated starch product.

30. The protein-coated starch product of claim 29 wherein the starch is

rice starch.

ANSWER 7 OF 28 CAPLUS COPYRIGHT 2005 ACS on STN
AN 2003:514148 CAPLUS
DN 139:306946
TI Technology study on the production of wheat gluten and **starch**
AU Mo, Chongwen
CS The Faculty of Food Science and Engineering, Zhengzhou Institute of Technology, Zhengzhou, Henan Province, 450052, Peop. Rep. China
SO Zhengzhou Gongcheng Xueyuan Xuebao (2002), 23(3), 40-43
CODEN: ZZGHAR; ISSN: 1671-1629
PB Zhengzhou Gongcheng Xueyuan Xuebao Bianjibu
DT Journal
LA Chinese

L7 ANSWER 8 OF 28 BIOSIS COPYRIGHT (c) 2005 The Thomson Corporation on STN
DUPLICATE 4
AN 2001:48885 BIOSIS
DN PREV200100048885
TI Wheat gluten phenolic acids: Occurrence and fate upon mixing.
AU Labat, Emilie; Morel, Marie-Helene; Rouau, Xavier [Reprint author]
CS Unite de Technologie des Cereales et des Agropolymeres, INRA-ENSAM, 2

ANSWER 9 OF 28 BIOSIS COPYRIGHT (c) 2005 The Thomson Corporation on STN
DUPLICATE 5

AN 1999:156531 BIOSIS

DN PREV199900156531

TI Changes of physical properties of wheat gluten and **starch** as a function of removing some attending substances.

AU Nierle, Werner [Reprint author]; Kersting, Hans-Josef [Reprint author]; Buermann, Ingrid

CS Inst. Biochem. Cereals Potatoes, Federal Cent. Cereal Potato Lipid Res.Detmold and Muenster, Schuetzenberg 12, D-32756 Detmold, Germany

SO Starch, (Dec., 1998) Vol. 50, No. 11-12, pp. 493-499. print.
CODEN: STARDD. ISSN: 0038-9056.

DT Article

LA English

ED Entered STN: 16 Apr 1999
Last Updated on STN: 16 Apr 1999

ANSWER 12 OF 28 BIOSIS COPYRIGHT (c) 2005 The Thomson Corporation on STN DUPLICATE 7

AN 1997:513933 BIOSIS

DN PREV199799813136

TI On the presence and activities of proteolytic enzymes in vital wheat gluten.

AU Bleukx, W.; Roels, S. P.; Delcour, J. A.

CS Katholieke Universiteit Leuven, Lab. Food Chem., Kardinaal Mercierlaan 92, B-3001 Heverlee, Belgium

SO Journal of Cereal Science, (1997) Vol. 26, No. 2, pp. 183-193.
CODEN: JCSCDA. ISSN: 0733-5210.

DT Article

LA English

ED Entered STN: 10 Dec 1997

L7 ANSWER 17 OF 28 CAPLUS COPYRIGHT 2005 ACS on STN
AN 1987:155056 CAPLUS
DN 106:155056
TI Process for removing undesirable constituents from wheat gluten products by alcohol and alkali extractions and ultrafilration
IN Lawhon, James T.
PA Texas A and M University, USA
SO U.S., 7 pp.
CODEN: USXXAM
DT Patent
LA English
FAN.CNT 1

| | PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|---|
| PI | US 4645831 | A | 19870224 | US 1984-679818 | 19841210 |
| PRAI | US 1984-679818 | | 19841210 | | |

ANSWER 19 OF 28 CAPLUS COPYRIGHT 2005 ACS on STN

AN 1984:101862 CAPLUS

DN 100:101862

TI Gel filtration and characterization of neutral salt extracted wheat gluten **proteins** varying in hydrophobic properties

AU Preston, K. R.

CS Grain Res. Lab., Can. Grain Comm., Winnipeg, MB, R3C 3G8, Can.

SO Cereal Chemistry (1984), 61(1), 76-82
CODEN: CECHAF; ISSN: 0009-0352

DT Journal

LA English

ANSWER 23 OF 28 CAPLUS COPYRIGHT 2005 ACS on STN
AN 1969:522608 CAPLUS
DN 71:122608
TI Preparation of **protein** concentrates by **extracting** **gluten** and water-soluble **proteins** from a slurry of wheat flour, water, and edible oil
IN Fellers, David A.
PA United States Dept. of Agriculture
SO U.S., 3 pp.
CODEN: USXXAM
DT Patent
LA English
FAN.CNT 1

| | PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|---|---|---|---|---|
| PI | US 3463770 | A | 19690826 | US 1966-556823 | 19660608 |
| PRAI | US 1966-556823 | A | 19660608 | | |

ANSWER 6 OF 40 BIOSIS COPYRIGHT (c) 2005 The Thomson Corporation on STN
DUPLICATE 3
AN 2002:548719 BIOSIS
DN PREV200200548719
TI Investigation of the effect of hot air drying of wheat gluten on its viscoelasticity and baking performance by a systems analytical model.
AU Meuser, F. [Reprint author]; Kutschbach, A.; Kieffer, R.; Wieser, H.; Schieberle, P.
CS Technical University Berlin, Institute of Food Technology, Seestrasse 11, D-13353, Berlin, Germany
meus1533@mailszrz.zrz.tu-berlin.de
SO Cereal Chemistry, (September-October, 2002) Vol. 79, No. 5, pp. 617-623. print.
CODEN: CECHAF. ISSN: 0009-0352.
DT Article
LA English
ED Entered STN: 23 Oct 2002
Last Updated on STN: 23 Oct 2002

ANSWER 20 OF 40 BIOSIS COPYRIGHT (c) 2005 The Thomson Corporation on STN

AN 1989:159164 BIOSIS

DN PREV198987081265; BA87:81265

TI PHYSICAL ANALYSIS OF ISOLATED GLUTEN MODEL SYSTEMS HEATED IN AN EXPERIMENTAL CONVENTIONAL-MICROWAVE OVEN.

AU LEPAGE C A [Reprint author]; GORDON J; DAVIS E A

CS DEP FOOD SCI NUTRITION, UNIV MINNESOTA, 1334 ECKLES AVE, ST PAUL 55108, USA

SO Cereal Chemistry, (1989) Vol. 66, No. 1, pp. 33-38.
CODEN: CECHAF. ISSN: 0009-0352.

DT Article

FS BA

LA ENGLISH

ED Entered STN: 25 Mar 1989
Last Updated on STN: 25 Mar 1989

US-PAT-NO: 5736178

DOCUMENT-IDENTIFIER: US 5736178 A
**See image for Certificate of Correction**

TITLE: Colloidal dispersions of gluten, method of making and use therefor

DATE-ISSUED: April 7, 1998


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Cook; Richard B. | Revere | MA | N/A | N/A |
| Shulman; Mark L. | Waltham | MA | N/A | N/A |


US-CL-CURRENT: 426/93, 426/138 , 426/626 , 426/640 , 426/656


ABSTRACT:

Film forming colloidal dispersions containing gluten-derived gluten and their methods of manufacture are described. The colloidal dispersion can be coated onto a variety of substrates to provide resistance to moisture, lipid and gas permeation, as well as provide a glossy sheen to the substrate. Foods coated with the colloidal dispersion are also described.


13 Claims, 0 Drawing figures

Exemplary Claim Number: 1

CLAIMS:

We claim:

1. A method for making an aqueous, colloidal dispersion of gluten microparticles, comprising the steps of:

a. preparing a dilute aqueous acid dispersion of gluten under agitating conditions to yield a stable colloidal dispersion of gluten microparticles, wherein the dispersion is stable and homogeneous under storage conditions; and

b. removing insoluble starch present in the gluten from the aqueous acid dispersion.

2. The method of claim 1 wherein the gluten is from wheat, barley, rye, rice or sorghum.

3. The method of claim 1 wherein step (b) is performed by centrifugation.

4. The method of claim 1 further comprising adding a wax latex or emulsion to the colloidal dispersion.

5. The method of claim 1 further comprising incorporating an additive into the colloidal dispersion which is selected from the group consisting of plasticizers, coloring agents, flavoring agents, trace minerals, vitamins, nutrients, nutraceuticals and combinations thereof.

6. The method of claim 1 further comprising drying the colloidal dispersion to form a powder.

7. An aqueous colloidal dispersion produced by the method of claim 1.

8. An edible film which was cast from an aqueous colloidal dispersion produced by the method of claim 1.

9. A method for making an edible coating on a substrate using a colloidal dispersion consisting essentially of gluten microparticles which are suspended in a dilute aqueous acid solution, comprising the steps of:

a) applying an aqueous colloidal dispersion of gluten microparticles produced according to the method of claim 21 to a substrate; and

b) drying the colloidal dispersion under ambient or elevated temperature conditions to fuse and form an edible continuous coating of gluten microparticles onto the surface of said substrate.

10. The method of claim 9 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereals, vitamins and tablets.

11. A substrate having an edible coating thereon, said coating comprising fused microparticles of gluten from an aqueous colloidal dispersion obtained by the method of claim 1, in which the liquid phase was removed at ambient or elevated temperature.

12. The coated substrate of claim 11 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereal, vitamins and tablets.

13. A powder produced by drying a stable, homogenous, dilute aqueous acid colloidal dispersion of gluten microparticles obtained by the method of claim 1.

US-PAT-NO: 5705207

DOCUMENT-IDENTIFIER: US 5705207 A

TITLE: Method of making gluten colloidal dispersions and edible coatings therefrom

DATE-ISSUED: January 6, 1998


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Cook; Richard B. | Chelmsford | MA | N/A | N/A |
| Shulman; Mark L. | Waltham | MA | N/A | N/A |


US-CL-CURRENT: 426/89, 426/56 , 426/626 , 426/656 , 426/93


ABSTRACT:

Film forming colloidal dispersions containing gluten or gluten-derived proteins and their methods of manufacture are described. The colloidal dispersion can be coated onto a variety of substrates to provide resistance to moisture, lipid and gas permeation, as well as provide a glossy sheen to the substrate. The colloidal dispersions can function as an adhesive for adhering particles onto the substrate. Foods coated with the colloidal dispersion are also described.


35 Claims, 0 Drawing figures

Exemplary Claim Number: 1

CLAIMS:

We claim:

1. A method for making an aqueous, colloidal dispersion of gluten microparticles, comprising the steps of:

a) preparing an aqueous acid dispersion of gluten comprising an opaque, particulate starch under agitating conditions to yield a colloidal dispersion of gluten microparticles which is stable and homogeneous under storage conditions; and

b) at least partially hydrolyzing opaque, particulate starch present in the gluten to yield a colloidal dispersion that can impart a glossy coating on a substrate.

2. The method of claim 1 wherein the gluten is from wheat, barley, rye, rice or sorghum.

3. The method of claim 1 wherein step (b) is performed by enzymatic hydrolysis.

4. The method claim 1 wherein the acid is selected from the group consisting of amino acids, alpha hydroxy acids, phosphoric acid, tricarboxylic acids and monocarboxylic acids.

5. The method of claim 1 further comprising adding a wax latex or emulsion to the colloidal dispersion.

6. The method of claim 1 further comprising incorporating an additive into the colloidal dispersion which is selected from the group consisting of plasticizers, coloring agents, flavoring agents, trace minerals, vitamins, nutrients, nutraceuticals and combinations thereof.

7. The method of claim 1 further comprising drying the colloidal dispersion to form a powder.

8. A colloidal dispersion comprising **gluten** microparticles produced by the method claim 7 which are rehydrated, wherein the microparticles are stably maintained in dispersion under storage conditions.

9. An aqueous colloidal dispersion produced by the method of claim 1.

10. The colloidal dispersion of claim 9 further comprising a wax and an additive selected from the group consisting of plasticizers, coloring agents, flavoring agents, trace minerals, vitamins, nutrients, nutraceuticals and combinations thereof.

11. A method for making an edible coating on a substrate, comprising the steps of:

a) apply an aqueous colloidal dispersion of **gluten** microparticles produced by the method of claim 1 to a substrate; and

b) drying the colloidal dispersion under ambient conditions to fuse and form an edible continuous coating of **gluten** microparticles onto the surface of said substrate.

12. The method of claim 11 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereals, vitamins, tablets, cheese, fried foods, french fries and snack foods.

13. A substrate having an edible coating thereon, said coating comprising fused microparticles of **gluten** from an aqueous colloidal dispersion, produced by the method of claim 1, in which the liquid phase was removed at ambient or elevated temperature.

14. The coated substrate of claim 13 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereal, vitamins, tablets, cheese, fried foods, french fries and snack foods.

15. A powder produced by drying a stable, homogenous, dilute aqueous acid colloidal dispersion of **gluten** microparticles produced by the method of claim 1.

16. An edible film derived from an aqueous colloidal dispersion produced by the method of claim 1.

17. A method for adhering edible particulate material onto the surface of a substrate, comprising the steps of:

a) coating the substrate with an aqueous colloidal dispersion of **gluten** microparticles produced according to the method of claim 1; and

b) applying an edible particulate material onto the coating before the coating completely dries.

18. The method of claim 17 wherein the edible particulate material is selected from the group consisting of fruit pieces, confections, candies, sprinkles, seeds, salt, spices and combinations thereof.

19. A method for making an aqueous, colloidal dispersion of gluten microparticles, comprising the steps of:

a) preparing an aqueous acid dispersion of gluten comprising an opaque, particulate starch under agitating conditions to yield a colloidal dispersion of gluten microparticles which is stable and homogeneous under storage conditions;

b) at least partially hydrolyzing opaque, particulate starch present in the gluten by treating the gluten with a starch hydrolyzing enzyme at a temperature suitable for enzyme activity, to yield a colloidal dispersion that can impart a glossy coating on a substrate; and

c) deactivating the enzyme.

20. The method of claim 19 wherein the enzyme is an alpha amylase, glucoamylase and combination thereof.

21. The method of claim 19 further comprising the step of treating the gluten of step (a) with a debranching enzyme and/or pregelatinizing the gluten.

22. An aqueous colloidal dispersion produced by the method of claim 19.

23. A method for making an edible coating on a substrate, comprising the steps of:

a) apply an aqueous colloidal dispersion of gluten microparticles produced by the method of claim 19 to a substrate; and

b) drying the colloidal dispersion under ambient conditions to fuse and form an edible continuous coating of gluten microparticles onto the surface of said substrate.

24. The method of claim 23 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereals, vitamins, tablets, cheese, fried foods, french fries and snack foods.

25. A substrate having an edible coating thereon, said coating comprising fused microparticles of gluten from an aqueous colloidal dispersion, produced by the method of claim 19, in which the liquid phase was removed at ambient or elevated temperature.

26. The coated substrate of claim 25 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereal, vitamins, tablets, cheese, fried foods, french fries and snack foods.

27. A powder produced by drying a stable, homogenous, dilute aqueous acid colloidal dispersion of gluten microparticles produced by the method of claim 19.

28. An edible film derived from an aqueous colloidal dispersion produced by

the method of claim 19.

29. A method for adhering edible particulate material onto the surface of a substrate, comprising the steps of:

a) coating the substrate with an aqueous colloidal dispersion of gluten microparticles produced according to the method of claim 19; and

b) applying an edible particulate material onto the coating before the coating completely dries.

30. The method of claim 29 wherein the edible particulate material is selected from the group consisting of fruit pieces, confections, candies, sprinkles, seeds, salt, spices and combinations thereof.

31. The method of claim 19 wherein the gluten is from wheat, barley, rye, rice or sorghum.

32. The method claim 19 wherein the acid is selected from the group consisting of amino acids, alpha hydroxy acids, phosphoric acid, tricarboxylic acids and monocarboxylic acids.

33. The method of claim 19 further comprising adding a wax latex or emulsion to the colloidal dispersion.

34. The method of claim 19 further comprising incorporating an additive into the colloidal dispersion which is selected from the group consisting of plasticizers, coloring agents, flavoring agents, trace minerals, vitamins, nutrients, nutraceuticals and combinations thereof.

35. The method of claim 19 further comprising drying the colloidal dispersion to form a powder.

US-PAT-NO: 6197353

DOCUMENT-IDENTIFIER: US 6197353 B1

TITLE: Gluten-derived colloidal dispersions, edible coatings therefrom and method of making

DATE-ISSUED: March 6, 2001


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Shulman; Mark L. | Waltham | MA | N/A | N/A |
| McGowan; Paul J. | Belmont | MA | N/A | N/A |
| Porcella; Catherine F. | West Newton | MA | N/A | N/A |
| Mallee; Francis M. | Acton | MA | N/A | N/A |
| Crosby; Guy A. | Weston | MA | N/A | N/A |
| Iyengar; Radha | Belmont | MA | N/A | N/A |


US-CL-CURRENT: 426/52, 426/102 , 426/28 , 426/292 , 426/293 , 426/49 , 426/656 , 426/93 , 426/94


ABSTRACT:

Film forming colloidal dispersions containing gluten-derived proteins and peptides and their methods of manufacture are described. The colloidal dispersion can be coated onto a variety of substrates to provide a glossy sheen to the substrate. The colloidal dispersions can function as an adhesive for adhering particles onto the substrate. Foods coated with the colloidal dispersion are also described.


19 Claims, 0 Drawing figures

Exemplary Claim Number: 1

CLAIMS:

We claim:

1. A method for producing an aqueous, gluten-derived colloidal dispersion, which upon application to a substrate imparts a gloss thereon, comprising:

a) preparing an aqueous dispersion of gluten under agitating conditions;

b) heating the product of step a) to a temperature sufficient to gelatinize the starch contained in the gluten;

c) hydrolyzing essentially all starch within the dispersion with a starch hydrolyzing enzyme;

d) hydrolyzing protein contained in the gluten using a protease under conditions sufficient to change the gluten dispersion viscosity; and

e) heating the colloidal dispersion to inactivate the protease and stabilize the colloidal dispersion; thereby producing an aqueous, gluten-derived colloidal dispersion which upon application to a substrate imparts a gloss thereon.

2. The method of claim 1 wherein the gluten is from corn, wheat, barley, rice, rye or sorghum.

3. The method of claim 1 wherein the aqueous gluten dispersion is acidified before, during or after the starch hydrolysis step.

4. The method of claim 1 wherein the protein hydrolysis step is carried out at from about 2 to about 3 hours.

5. The method of claim 1 wherein the gelatinization step is carried out at a temperature of from about 65.degree. C. to about 85.degree. C.

6. The method of claim 1 wherein the starch hydrolyzing enzyme is an enzyme containing, glucoamylase, amylase or pullanase having, an activity sufficient to hydrolyze the starch to maltose or glucose.

7. The method of claim 1, further comprising heating the gluten dispersion after starch hydrolysis is completed to inactivate the starch hydrolyzing enzyme.

8. The method of claim 1 further comprising admixing a stabilizing agent into the product of step d).

9. The method claim 1, further comprising the step of diluting the gluten dispersion to obtain a total solids content of from about 11% to about 16% by weight.

10. The method of claim 1, further comprising adding a preservative to the final product.

11. The method of claim 1, further comprising adding color and/or flavor to the final product.

12. The method of claim 1 wherein the amount of gluten dispersed in step a) is from about 10% to about 16% by weight solids.

13. A method for making an edible coating on a substrate, comprising the steps of:

a) apply an aqueous colloidal dispersion of gluten-derived protein produced by the method of claim 1 to a substrate; and

b) drying the colloidal dispersion under ambient or elevated temperature to fuse and form an edible continuous coating of gluten-derived protein onto the surface of said substrate.

14. The method of claim 13 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereals, vitamins, tablets, fried foods, french fries and snack foods.

15. A substrate having an edible coating thereon, said coating comprising fused microparticles of a gluten-derived protein from an aqueous colloidal dispersion, produced by the method of claim 1, in which the aqueous phase was removed at ambient or elevated temperature.

16. The coated substrate of claim 15 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereal, vitamins, tablets, fried

foods, french fries and snack foods.

17. A method for adhering edible particulate material onto the surface of a substrate, comprising:

a) coating the substrate with an aqueous, gluten-derived colloidal dispersion produced by the method of claim 1;

b) applying an edible particulate material onto the coating before the coating completely dries; and

c) drying the colloidal dispersion under ambient or elevated temperature to fuse and form an edible continuous coating of gluten-derived protein onto the surface of said substrate.

18. The method of claim 17 wherein the edible particulate material is selected from the group consisting of fruit pieces, confections, candies, sprinkles, seeds, salt, spices and combinations thereof.

19. A powder produced by drying an aqueous, gluten-derived colloidal dispersion produced by the method of claim 1.

US-PAT-NO: 6174559

DOCUMENT-IDENTIFIER: US 6174559 B1

TITLE: Gluten-derived colloidal dispersions and edible coatings therefrom and method of making

DATE-ISSUED: January 16, 2001


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Shulman; Mark L. | Waltham | MA | N/A | N/A |
| Rudie; Noel G. | Chelmsford | MA | N/A | N/A |
| Mallee; Francis M. | Acton | MA | N/A | N/A |
| Duda; Mark G. | Lynn | MA | N/A | N/A |


US-CL-CURRENT: 426/656, 426/102 , 426/28 , 426/292 , 426/293 , 426/49 , 426/52 , 426/93 , 426/94


ABSTRACT:

Film forming colloidal dispersions containing gluten-derived proteins and peptides and their methods of manufacture are described. The colloidal dispersion can be coated onto a variety of substrates to provide a glossy sheen to the substrate. The colloidal dispersions can function as an adhesive for adhering particles onto the substrate. Foods coated with the colloidal dispersion are also described.


33 Claims, 0 Drawing figures

Exemplary Claim Number: 1

CLAIMS:

We claim:

1. A method for producing an aqueous, gluten-derived colloidal dispersion, which upon application to a substrate imparts a gloss thereon, comprising:

a) preparing an aqueous dispersion of gluten having starch contained therein under agitating conditions;

b) hydrolyzing protein contained in the gluten using a protease under conditions sufficient to change the gluten dispersion viscosity;

c) heating the product of step b) to a temperature sufficient to gelatinize the starch contained in the gluten; and

d) hydrolyzing essentially all starch within the dispersion with a starch hydrolyzing enzyme; thereby producing an aqueous, gluten-derived colloidal dispersion which upon application to a substrate imparts a gloss thereon.

2. The method of claim 1 wherein the gluten is from corn, wheat, barley, rice, rye or sorghum.

3. The method of claim 1 wherein the aqueous gluten dispersion is acidified

before, during or after the protease step.

4. The method of claim 1 wherein the protein hydrolysis step is carried out at from about 2 to about 3 hours.

5. The method of claim 1 wherein the gelatinization step is carried out at a temperature of from about 65.degree. C. to about 95.degree. C.

6. The method of claim 1 wherein the starch hydrolyzing enzyme is an enzyme containing glucoamylase, amylase or pullanase having an activity sufficient to hydrolyze the starch to maltose or glucose.

7. The method of claim 1 wherein the starch hydrolysis step is carried out at a temperature of from about 65.degree. C. to 85.degree. C.

8. The method of claim 1, further comprising heating the gluten dispersion after starch hydrolysis is completed to inactivate the starch hydrolyzing enzyme.

9. The method claim 1, further comprising the step of diluting the colloidal dispersion to obtain a total solids content of from about 10% to about 17% by weight.

10. The method of claim 1, further comprising adding a preservative to the final product.

11. The method of claim 1, further comprising adding color and/or flavor to the final product.

12. The method of claim 1 wherein the amount of gluten dispersed in step a) is from about 1% to about 35% by weight solids.

13. The method of claim 1, further comprising admixing a stabilizing agent into the product of step d).

14. An aqueous, gluten-derived colloidal dispersion obtainable by the method of claim 1.

15. A substrate having an edible coating thereon, said coating comprising fused microparticles of a gluten-derived protein and peptides from an aqueous colloidal dispersion, produced by the method of claim 1, in which the liquid phase was removed at ambient or elevated temperature.

16. The coated substrate of claim 15 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereal, vitamins, tablets, fried foods, french fries and snack foods.

17. An edible film derived from an aqueous colloidal dispersion produced by the method of claim 1.

18. A method for adhering edible particulate material onto the surface of a substrate, comprising the steps of:

a) coating the substrate with an aqueous, gluten-derived colloidal dispersion produced by the method of claim 1; and

b) applying an edible particulate material onto the coating before the coating completely dries.

19. The method of claim 18 wherein the edible particulate material is selected from the group consisting of fruit pieces, confections, candies, sprinkles, seeds, salt, spices and combinations thereof.

20. A method for producing an aqueous, gluten-derived colloidal dispersion, which upon application to a substrate imparts a gloss thereon, comprising:

a) preparing an aqueous dispersion of gluten having starch contained therein under agitating conditions;

b) hydrolyzing protein contained in the gluten using a protease under conditions sufficient to change the gluten dispersion viscosity;

c) physically removing starch from the dispersion by centrifugation; and

d) hydrolyzing essentially all residual starch remaining within the dispersion with a starch hydrolyzing enzyme; thereby producing an aqueous, gluten-derived colloidal dispersion, which upon application to a substrate imparts a gloss thereon.

21. The method of claim 20 wherein the aqueous gluten dispersion is acidified before, during or after the protease step.

22. The method of claim 20 wherein the protein hydrolysis step is carried out at from about 2 to about 3 hours.

23. The method of claim 20 wherein the starch hydrolyzing enzyme is an enzyme containing glucoamylase, amylase or pullanase having an activity sufficient to hydrolyze the starch to maltose or glucose.

24. The method of claim 20 wherein the starch hydrolysis step is carried out at a temperature of from about 65.degree. C. to 85.degree. C.

25. The method of claim 20, further comprising heating the gluten dispersion after starch hydrolysis is completed to inactivate the starch hydrolyzing enzyme.

26. The method claim 20, further comprising the step of diluting the gluten dispersion to obtain a total solids content of from about 10% to about 17% by weight.

27. The method of claim 20, further comprising adding a preservative to the final product.

28. The method of claim 20, further comprising adding color and/or flavor to the final product.

29. The method of claim 20 wherein the amount of gluten dispersed in step a) is from about 10% to about 35% by weight solids.

30. The method of claim 20 further comprising admixing a stabilizing agent into the product of step d).

31. An aqueous, gluten-derived colloidal dispersion obtainable by the method of claim 20.

32. A method for making an edible coating on a substrate, comprising the steps of:

a) apply an aqueous, gluten-derived colloidal dispersion produced by the

method of claim 1 to a substrate; and

b) drying the colloidal dispersion under ambient or elevated temperature to fuse and form an edible continuous coating of **gluten**-derived **protein** onto the surface of said substrate.

33. The method of claim 32 wherein the substrate is selected from the group consisting of chocolates, high sugar confections, fruits, meats, baked goods, vegetables, seeds, nuts, beans, cereals, vitamins, tablets, fried foods, french fries and snack foods.

US-PAT-NO: 3832472

DOCUMENT-IDENTIFIER: US 3832472 A

TITLE: WHEAT PRODUCT

DATE-ISSUED: August 27, 1974

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Rodgers; Nelson E. | Wayzata | MN | N/A | N/A |
| Durst; Jack R. | Osseo | MN | N/A | N/A |

US-CL-CURRENT: 426/627

ABSTRACT:

This wheat product comprises endosperm in which the cellular structure is completely disrupted and dispersed. The starch granules are free and unassociated with gluten protein particles. The granules are intact, ungelatinized and retain the native anisotropic structure. The gluten protein is metamorphosed to smoothly contoured particles containing very little starch and is substantially undenatured with respect to doughing function. Depending on intended use, the germ and aleurone fractions of the wheat grain can be excluded or included in the product. The product can be used as an aqueous dispersion or in a dried form.

14 Claims, 2 Drawing figures

Number of Drawing Sheets: 2

CLAIMS:

What is claimed is:

1. A wheat product wherein the normal cellular structure of the endosperm is substantially completely disrupted produced by a process during which the endosperm is dispersed in an aqueous medium, the starch granules are maintained in a substantially intact and ungelatinized form and the gluten protein is dispersed and wherein the husks are removed from said product; said wheat product comprising:

a. wheat starch granules that are substantially intact, ungelatinized and unoccluded by gluten protein;

b. homogeneous, smoothly contoured gluten protein particles containing only minor amounts of occluded starch; said gluten protein being substantially undenatured with respect to doughing function.

2. The product of claim 1 wherein substantially all of the starch granules are impermeable to congo red.

3. The product of claim 1 wherein the starch granules resist attack by .beta.-amylase enzymes.

4. The product of claim 1 dispersed in an aqueous medium.

5. The product of claim 1 in a dried form.

6. The product of claim 1 wherein substantially all of the starch granules are anisotropic when viewed microscopically in polarized light.

7. The product of claim 6 wherein at least 80 percent by weight of said gluten protein is contained in particles having sizes from 75 .mu.m to 300 .mu.m.

8. The product of claim 6 wherein at least 90 percent by weight of said gluten protein is contained in particles more than 50 .mu.m in randomly measured dimension.

9. The product of claim 8 containing substantially all of the germ and aleurone.

10. The product of claim 9 containing from about 0.005 to 4.0 parts by weight oil per part by weight water.

11. The product of claim 6 wherein at least 90 percent by weight of said gluten protein is contained in particles more than 75 .mu.m to 300 .mu.m in randomly measured dimension.

12. The product of claim 11 wherein the starch damage as indexed by susceptibility to hydrolysis by .beta.-amylase, according to Method No. 76-30A of the American Association of Cereal Chemists, is less than 4.5%.

13. The product of claim 11 containing substantially no germ or aleurone.

14. The product of claim 11 wherein the ether-extractable lipid content is less than 0.5 percent by weight of the product.

US-PAT-NO: 6106881

DOCUMENT-IDENTIFIER: US 6106881 A

TITLE: Process for preparing dough or batter product containing gliadin or glutenin extracted from wheat gluten

DATE-ISSUED: August 22, 2000


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Yajima; Mizuo | Tokyo | N/A | N/A | JP |
| Katahira; Ryouta | Tokyo | N/A | N/A | JP |


US-CL-CURRENT: 426/549, 426/425 , 426/429 , 426/436 , 426/481 , 426/496 , 426/656 , 426/94


ABSTRACT:

A food composition comprises gluten, a gliadin or glutenin and food stuff such as an additive for chewing gum, a batter for frying, a dough, a seafood paste and a livestock paste. A food quality such as taste is improved in the composition.


9 Claims, 0 Drawing figures

Exemplary Claim Number: 1

CLAIMS:

What is claimed is:

1. In a process for preparing a bread product, the improvement comprising extracting wheat gluten with an extractant of an acidic aqueous solution of ethanol having a concentration of no more than 30% by volume, separating a gliadin fraction containing at least 50 wt. % gliadin from the extractant, combining at least 0.5 parts by weight of the gliadin fraction with 100 parts by weight of at least one of wheat flour and starch flour to form a dough composition, mixing a yeast and water with the dough composition to form a resultant mixture and baking the resultant mixture to form the bread product.

2. The process of claim 1, additionally comprising the step of adding an emulsifying agent and a pH regulator to the combined gliadin fraction and at least one of wheat flour and starch flour.

3. The process of claim 1, wherein the acidic aqueous ethanol solution has a pH of from 3.0-5.5.

4. In a process for manufacturing a dough composition, the improvement comprising extracting wheat gluten with an extractant of an acidic aqueous solution of ethanol having a concentration of no more than 30% by volume, separating a glutenin fraction containing 10-70 wt. % glutenin from the extractant and combining at least 0.5 parts by weight of the glutenin fraction with 100 parts by weight of at least one of wheat flour and starch flour to form the dough composition.

5. The process of claim 4, wherein the ethanol concentration is from 10-20% by volume.

6. The process of claim 4, wherein the acidic aqueous ethanol solution has a pH of from 3.0-5.5.

7. The process of claim 4, additionally comprising the step of adding an emulsifying agent to the combined glutenin fraction and flour.

8. In a process for manufacturing a batter composition for frying foods, the improvement comprising extracting wheat gluten with an extractant of a 30-70% by volume aqueous solution of ethanol or an acidic aqueous solution of ethanol having a concentration of no more than 30% by volume, separating a glutenin fraction containing at least 40 wt. % glutenin from the extractant and combining at least 0.5 wt. % of the glutenin fraction, based on the weight of the batter, with wheat flour to form the batter composition.

9. The process of claim 8, wherein an acidic aqueous solution of ethanol having a concentration of no more than 30% by volume and a pH of from 3.5-5.5 is used as the extractant.

US-PAT-NO: 5593717

DOCUMENT-IDENTIFIER: US 5593717 A

TITLE: Method of making vital wheat gluten into fibers

DATE-ISSUED: January 14, 1997


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Huber; Cynthia | Sanborton | NH | 03269 | N/A |
| Longo; Nancy | Tilton | NH | 03269 | N/A |


US-CL-CURRENT: 426/656, 426/578 , 426/62 , 426/622


ABSTRACT:

A method of transforming the clumped untextured putty-like and high viscoelastic adhesion physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering permanently textured fiber strand structure by mixing the vital wheat gluten with flour and then shredding, and denaturing hot moisture, the fiber using enabling the creation of wheat gluten analogs for ground meat fiber products, such as hamburger and the like.


25 Claims, 11 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

CLAIMS:

What is claimed is:

1. A method of permanently transforming a clumped putty-like untextured mass and relatively high viscoelastic adhesion, physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering textured fiber strand structure, that comprises, intimately mixing flour with vital wheat gluten powder to interleave with and separate the gluten powder particles in the mixture; at substantially room temperature, hydrating the mixture to enable the absorption of water by the mixture to expand the gluten into a less viscoelastic mass; shredding the mass into a plurality of separated streams of strands of elongated continuous fibers; dropping the separate strands under the action of gravity as a loose deposit upon a retaining surface; immediately subjecting the deposit to heated moisture along the separate fibers within and throughout the deposit; continuing the application of heated moisture for a sufficient time for the protein of the separate fibers within the deposit to become substantially denatured, to remove the bulk of the viscoelastic adhesion properties of the gluten; and permitting evaporation of excess moisture from the deposit to produce a loose layered permanent fiber structure of relatively low viscoelasticity.

2. A method as claimed in claim 1 and in which the temperature of the heated moisture is of the order of about 212.degree. F.

3. A method as claimed in claim 2 and in which said sufficient time for denaturing is of the order of about 25 minutes.

4. A method as claimed in claim 2 and in which the weight proportion of gluten powder to flour is in the range of from about 1:0.5 to about 1:0.15.

5. A method as claimed in claim 1 and in which a leavening agent is added to said mixture before hydrating.

6. A method as claimed in claim 5 and in which said leavening agent comprises nutritional yeast.

7. A method as claimed in claim 1 and in which, upon the deposits dropping upon the retaining surface, the surface is passed through a heated water tank to effect the moisture absorption and the ultimate gluten fiber denaturation.

8. A method as claimed in claim 7 and in which, prior to passing the deposit-carrying retaining surface through the tank, the deposit is formed into a predetermined shape.

9. A method as claimed in claim 7 and in which the deposits are restrained from tumbling and elongation during the heated water treatment.

10. A method as claimed in claim 1 and in which the fibers produced by the shredding are of dimensions similar to those of ground meat.

11. A method as claimed in claim 10 and in which the cross-dimension of the fibers is of the order of about 0.3 inches.

12. A wheat gluten analog for ground meat formed by the method of claim 10.

13. A wheat gluten analog as claimed in claim 12 and in which the composition of the analog is 1 part wheat gluten and from about 0.5 to 0.15 part flour, by weight.

14. A wheat gluten analog as claimed in claim 13 formed from a dry mixture of vital wheat gluten protein powder, dry grain flour, and with added nutritional leavening agent and spices.

15. A wheat gluten analog for pieces, patties and loaves of ground beef hamburger, comprising loose layers of fiber strands of heat-denatured vital wheat gluten.

16. A method of producing a vital wheat gluten analog of ground meat, such as hamburger, by transforming the clumped putty-like untextured mass and relatively high viscoelastic adhesion physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering textured fiber strand structural analog of ground meat, the method comprising, intimately mixing grain flour particles with vital wheat gluten powder particles and nutritional yeast to interleave the flour particles with and separate the gluten powder particles in the mixture, the weight ratios of gluten powder particles to flour particles being of the order of from about 1:0.5 to about 1:0.15; at substantially room-temperature, hydrating the mixture in a ratio of the order of about 12 ounces of mixture to about 8 ounces of water to enable the absorption of water by the mixture to expand the gluten into a less viscoelastic mass; grinding and extruding the mass into a plurality of separated streams of strands of elongated continuous fibers of cross-dimension of the order of about 0.3 inches; dropping the separated strands under the action of gravity as a loose deposit upon a retaining surface; immediately immersing the deposit in heated water of about

212.degree. F. wetting the separate fibers within and throughout the deposit; continuing the heated water immersion for a sufficient time of the order of about 25 minutes for the protein of the separate fibers within the deposit to become substantially denatured, to remove the bulk of the viscoelastic adhesion properties of the gluten, simulating ground meat fibers; and permitting evaporation of excess moisture from and shrinkage of the cooling deposit to produce a loose layered permanent fiber structural analog of the ground meat.

17. A method as claimed in claim 16 and in which, after dropping of the deposits, they are formed into a predetermined shape of hamburger patties or loaves, before immersion in the heated water.

18. A method as claimed in claim 17 and in which flavoring and coloring are added to the mixture further to simulate the ground meat product.

19. A method as claimed in claim 18 and in which the analog is cooked in the same manner generally employed with ground meat products.

20. A method as claimed in claim 7 and in which the analog is fast frozen for subsequent cooking.

21. A method of permanently transforming clumped putty-like untextured mass and relatively high viscoelastic adhesion physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering textured fiber strand structure, that comprises, intimately mixing flour with vital wheat gluten powder to interleave with and separate the gluten powder particles in the mixture at substantially room temperature, hydrating the mixture to enable the absorption of water by the mixture to expand the gluten into a less viscoelastic mass; shredding the mass into a plurality of separated streams of strands of elongated continuous fibers; dropping the separate strands under the action of gravity as a loose deposit upon a retaining surface; immediately subjecting the deposit to heated moisture along the separate fibers within and throughout the deposit; continuing the application of heated moisture for a sufficient time for protein of the separate fibers within the deposit to become substantially denatured, to remove the bulk of the viscoelastic adhesion properties of the gluten; and permitting evaporation of excess moisture from the deposit to produce a loose layered permanent fiber structure of relatively low retained viscoelasticity and in which a leavening agent is added to said mixture before hydrating.

22. A method as claimed in claim 21 and in which said leavening agent comprises nutritional yeast.

23. A wheat gluten analog for ground meat formed by a method of permanently transforming clumped putty-like untextured mass and relatively high viscoelastic adhesion physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering textured fiber strand structure, that comprises, intimately mixing flour with vital wheat gluten powder to interleave with and separate the gluten powder particles in the mixture; at substantially room temperature, hydrating the mixture to enable the absorption of water by the mixture to expand the gluten into a less viscoelastic mass; shredding the mass into a plurality of separated streams of strands of elongated continuous fibers; dropping the separate strands under the action of gravity as a loose deposit upon a retaining surface; immediately subjecting the deposit to heated moisture along the separate fibers within and throughout the deposit; continuing the application of heated moisture for a sufficient time for protein of the separate fibers within the deposit to become substantially denatured, to remove the bulk of the viscoelastic adhesion properties of the gluten; and permitting evaporation of excess moisture from the deposit to produce a loose layered permanent fiber structure of relatively

low retained viscoelasticity and in which the fibers produced by the shredding are of dimensions similar to those of ground meat, and in which the cross-dimension of the fibers is of the order of about 0.3 inches and in which the composition of the analog is 1 part wheat gluten and from about 0.5 to 0.15 part flour, by weight and formed from a dry mixture of vital wheat gluten protein powder and grain flour, and with added nutritional leaving agent and spices.

24. A method as claimed in claim 1 and in which, prior to the deposits of fibers becoming substantially denatured, they are formed into predetermined shapes.

25. A method as claimed in claim 1 and in which, promptly following the excess moisture evaporation, the fiber structure is refrigerated or frozen .

US-PAT-NO: 5439526

DOCUMENT-IDENTIFIER: US 5439526 A

TITLE: Process for fractionating wheat flours to obtain protein concentrates and prime starch

DATE-ISSUED: August 8, 1995


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Czuchajowska; Zuzanna | Moscow | ID | N/A | N/A |
| Pomeranz; Yeshajahu | Pullman | WA | N/A | N/A |


US-CL-CURRENT: 127/67, 127/56 , 127/70 , 127/71


ABSTRACT:

Disclosed and claimed is a rapid, simple process for fractionating wheat flour into components comprising protein concentrates and prime starch. The claimed method utilizes minimal water and produces a low waste water load. Flour and liquid are mixed to form a dough. Additional liquid is added to the dough and the dough and liquid are vigorously dispersed. The dispersion is centrifuged and forms distinct fractions-layers that are separated for the recovery of vital gluten and prime starch.


6 Claims, 0 Drawing figures

Exemplary Claim Number: 1

CLAIMS:

We claim:

1. A process for fractionating wheat flour into components including a protein concentrate, prime starch, and water solubles, wherein said process consists essentially of the following steps:

A) forming a gluten-containing dough comprising liquid and flour wherein said dough is formed by mixing said flour and said liquid;

B) adding additional liquid to the gluten-containing dough produced in step A to achieve a total liquid to flour ratio about 2 to 1 to about 2.5 to 1;

C) dispersing the composition produced in step B by high speed blending; and

D) centrifuging the composition produced in step C in order to obtain distinct layers of protein concentrate, prime starch and water solubles, wherein said dough is not heated to temperatures exceeding 50.degree. C.

2. The process, according to claim 1, wherein said liquid is a dilute sodium chloride solution in water.

3. The process, according to claim 2, wherein said dilute solution comprises less than about one percent sodium chloride in water.

4. The process, according to claim 1, further comprising the step of allowing said dough to relax after it is formed and before liquid is added.

5. The process, according to claim 1, wherein said dough is allowed to relax for approximately 40 minutes at about 15 degrees Centigrade.

6. The process, according to claim 1, wherein said liquid and flour are present in a ratio of about 1:1 or there is more flour than liquid.

US-PAT-NO: 4494530

DOCUMENT-IDENTIFIER: US 4494530 A

TITLE: Separation of gluten and starch from wheat flour

DATE-ISSUED: January 22, 1985


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Jansma; Wytze | Nijmegen | N/A | N/A | NL |
| Mars; Jan | Nijmegen | N/A | N/A | NL |
| Stoutjesdijk; Pieter G. | Wychen | N/A | N/A | NL |
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US-CL-CURRENT: 127/69, 127/24 , 530/374 , 530/375


ABSTRACT:

In a process utilizing a battery of hydrocyclones for separating wheat starch and gluten contained in an aqueous wheat flour slurry, the slurry is supplied to a first section of the hydrocyclone battery, in which a gluten fraction is removed as overflow, and the starch-rich fraction from such first battery section is first treated to reduce its pentosan content and is then treated in a second section of the hydrocyclone battery which delivers a concentrated starch fraction as underflow.


3 Claims, 1 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

CLAIMS:

What we claim is:

1. A process for separating wheat starch and gluten, present in a pentosan-containing aqueous wheat flour slurry, which process comprises the steps of feeding said aqueous flour slurry into a first section of a hydrocyclone apparatus which delivers a starch-rich underflow fraction, and an overflow fraction containing gluten and some starch; removing agglomerated gluten from said overflow fraction by screening; centrifuging the starch-containing throughput from this screening operation and the underflow fraction from said first section of the hydrocyclone apparatus thereby to separate off a pentosan-containing water fraction as centrifuge overflow; and feeding the centrifuge underflow into a second section of the hydrocyclone apparatus in which second section starch is washed in counter-current with water and from which a concentrated washed starch fraction is delivered as underflow, whereby the separation of the pentosan-containing water fraction improves the yield of starch from the second section of the hydrocyclone apparatus.

2. A process according to claim 1, wherein at least the underflow fraction from the first hydrocyclone section is screened to remove fiber.

3. A process for separating wheat starch and gluten present in a pentosan-containing aqueous wheat flour slurry, which process comprises the steps of feeding said aqueous flour slurry into a first section of a hydrocyclone apparatus which delivers a starch-rich underflow fraction, and an overflow fraction containing gluten and some starch; removing agglomerated gluten from said overflow fraction by a screening operation; subjecting the starch-containing throughput from that screening operation and the underflow fraction from said first section of the hydrocyclone apparatus first to a screening treatment to reduce their fiber content and then to centrifuging, thereby to separate off a pentosan-containing water fraction as centrifuge overflow; and feeding the centrifuge underflow into a second section of the hydrocyclone apparatus in which second section the starch is washed in counter-current with water and from which a concentrated washed starch fraction is delivered as underflow, whereby the separation of the pentosan-containing water fraction improves the yield of starch from the second section of the hydrocyclone apparatus.

US-PAT-NO: 4217414

DOCUMENT-IDENTIFIER: US 4217414 A
**See image for Certificate of Correction**

TITLE: Process for separating and recovering vital wheat gluten from wheat flour and the like

DATE-ISSUED: August 12, 1980

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Walon; Raoul G. P. | Brussels | N/A | N/A | BE |

US-CL-CURRENT: 435/95, 435/272 , 435/96 , 435/99

ABSTRACT:

A mixture of vital wheat gluten and starch containing at least 25% protein, e.g. a protein-rich fraction of wheat flour, is treated with a bacterial alpha-amylase (preferably substantially free of protease) under conditions which solubilize the starch but do not unduly solubilize, or denature, the vital gluten. Specifically, the temperature should be not above about 80.degree. C. and the time of treatment should not exceed about 6 hours. After the enzymatic treament the gluten, which still retains its vital properties, is separated out, and the solubilized starch fraction is recovered or subjected to further processing.

16 Claims, 0 Drawing figures

Exemplary Claim Number: 1

CLAIMS:

What is claimed is:

1. A process for treating a mixture of vital wheat gluten and wheat starch obtained from wheat flour containing at least 25% protein comprising:

(a) preparing an aqueous suspension of said mixture;

(b) subjecting the aqueous suspension to the action of bacterial alpha-amylase is substantially free of protease and is derived from a bacillus microorganism under conditions whereby a substantial amount of said starch is solubilized without undergoing gelatinization, said conditions comprising a temperature of from about 45.degree. to about 80.degree. C., a pH of from about 5 to about 7, and a time of less than 6 hours; and

(c) separating solid, vital gluten from the solubilized starch.

2. The process of claim 1 wherein the aqueous suspension subjected to the action of alpha-amylase is substantially free of solubles.

3. The process of claim 1 wherein the mixture of vital wheat gluten and wheat starch comprises a protein-rich fraction obtained from wheat flour.

4. The process of claim 3, wherein the protein-rich fraction contains from about 25% to about 80% protein.

5. The process of claim 4, wherein said fraction contains from about 30% to about 40% protein.

6. The process of claim 3 wherein an aqueous slurry of wheat flour is subjected to centrifugal decantation to separate substantially protein-free wheat starch fraction from said protein-rich fraction.

7. The process of claim 6 wherein solubles present in said protein-rich fraction are removed prior to subjecting said fraction to the action of alpha-amylase.

8. The process of claim 1 wherein the alpha-amylase is one derived from a microorganism selected from the group consisting of Bacillus licheniformis and Bacillus subtilis.

9. The process of claim 7 wherein the conditions of starch solubilization comprise a temperature of from 60.degree. C. to 80.degree. C. for a time of less than 30 minutes.

10. The process of claim 1 wherein the alpha-amylase is added in an amount in excess of the mininum amount necessary to solubilize all of the starch present, and wherein the time of the solubilization does not exceed about 3 hours.

11. The process of claim 10 wherein, following the separation of the vital gluten, the solubilized starch solution contains still active enzymes and is combined with the wheat starch fraction obtained by centrifugal decantation, and the resulting mixture is subjected to a solubilization process.

12. The process of claim 11 wherein the solubilized starch is saccharified with a saccharifying enzyme.

13. The process of claim 12 wherein the saccharifying enzyme is glucoamylase.

14. The process of claim 12 wherein the saccharifying enzyme is a maltogenic enzyme.

15. The process of claim 1 wherein the conditions of starch solubilization comprise a temperature of from 45.degree. to 60.degree. C.

16. The process of claim 1 wherein the conditions of starch solubilization comprise a temperature of from 60.degree. C. to 80.degree. C. for a time of less than 30 minutes.

US-PAT-NO: 3951938

DOCUMENT-IDENTIFIER: US 3951938 A

TITLE: Method of separating gluten from wheat flour

DATE-ISSUED: April 20, 1976

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Kerkkonen; H. K. | Raisio | N/A | N/A | SF |
| Laine; K. M. J. | Raisio | N/A | N/A | SF |
| Alanen; M. A. | Raisio | N/A | N/A | SF |
| Renner; H. V. | Raisio | N/A | N/A | SF |

US-CL-CURRENT: 530/374, 127/67

ABSTRACT:

A process for separating gluten with a protein content of at least 80% on a dry base and in a vital and non-denatured condition from wheat flour which comprises:

1. Mixing wheat flour with water in a weight ratio of 1.2-2.0 parts water per part wheat at a temperature of 30.degree.-50.degree.C to form a suspension of flour in water;

2. Homogenizing said suspension to achieve a free-flowing dispersion of wheat flour in water by passing said suspension through a mill of the pin-mill type;

3. Separating from said dispersion a main heavy portion (A) comprising a starch and a light portion (B) comprising a protein concentrate;

4. Allowing said light portion (B) to stand, free of agitation without dilution, at 30.degree.-50.degree.C for 10-90 minutes to form gluten thread-like formations without separation;

5. Thereafter, adding to said light portion (B) at least one part fresh or recycled water per part of said portion (B) and subjecting the so-diluted liquid to a beating action whereby to agglomerate said gluten formations with one another and squeeze the water containing non-gluten solids substantially out of the resultant agglomerates; and

6. Separating said gluten agglomerates from the remaining liquid.

5 Claims, 1 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

CLAIMS:

What is claimed is:

1. A process for separating gluten having a protein content of at least 80% on a dry basis and in a vital or nondenatured condition from wheat flour which comprises:

1. Mixing wheat flour with water in a weight ratio of 1.2-2.0 parts water per part wheat at a temperature of 30.degree.-50.degree.C to form a suspension of flour and water;

2. Homogenizing the suspension to achieve a free-flowing dispersion of wheat flour and water by passing said suspension through a mill of the pin-mill type;

3. Separating from said dispersion a main heavy portion (A) comprising starch and a light portion (B) comprising a protein concentrate;

4. Allowing said light portion (B) to stand, free of agitation and without dilution, at 30.degree.-50.degree.C for at least 10 minutes to form gluten thread-like formations without separation;

5. Thereafter adding to said light portion fresh or recycled water in the amount of at least one part water per part of said portion (B) and subjecting the so diluted liquid to a beating action whereby to agglomerate said gluten formations with one another and squeeze the water-containing non-gluten solids substantially out of the resultant agglomerates; and

6. Separating the gluten agglomerates from the remaining liquid.

2. A process according to claim 1, wherein the amount of water added in step 5 is between 1.0 and 2.0 parts of water per part of said portion (B) and the light portion (B) is held without dilution and agitation for between 10 and 90 minutes.

3. A process according to claim 1, wherein the total amount of water employed in the process is between 2.0 and 3.0 - fold that of the wheat measured on a weight basis.

4. A process according to claim 1, wherein each of the consecutive steps are carried out continuously.

5. A process according to claim 1, wherein the gluten which is separated in step 6 is dried at a temperature no higher than 60.degree.C.

US-PAT-NO: 4473299

DOCUMENT-IDENTIFIER: US 4473299 A

TITLE: Gluten producing system

DATE-ISSUED: September 25, 1984


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Guibert; Raul | Los Angeles | CA | 90024 | N/A |


US-CL-CURRENT: 366/76.4, 366/156.2 , 366/157.3 , 366/158.1 , 366/158.2 , 366/169.1 , 366/170.2 , 366/77 , 366/86 , 366/90


ABSTRACT:

A system for producing gluten continuously at a rapid rate, the system including a vertical tube having an inlet at its upper end to receive a flour paste, the lower end of the tube being perforated to define a separation zone surrounded by a water jacket. A rotating shaft coaxially disposed in the tube acts to drive a conveyor screw within the separation zone, the screw having nozzles therein to eject water toward the inner wall of the tube. Keyed to the shaft is a main screw that is spaced from the extruder screw to define a collection zone therebetween, the main screw acting to work the paste fed into the inlet to produce dough which is discharged into the collection zone where it is picked up by the conveyor screw and advanced through the separation zone as a thin dough coil on the inner wall of the tube where it is subjected on one face to water jets from the perforations and on the opposite face to water ejected from the nozzles, thereby dissolving the starch and other soluble components of the dough to produce a milky liquid. The resultant slurry of the gluten and the milky liquid is deposited on a filter to extract the gluten.


8 Claims, 3 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

CLAIMS:

I claim:

1. A gluten-producing system operating in conjunction with a mixer which mixes flour and water to produce a paste, said system comprising:

A. a vertical tube having an inlet adjacent its upper end to receive said paste, the lower end portion of the tube adjacent its outlet being perforated to define a separation zone;

B. a rotating shaft coaxially disposed in said tube to drive a conveyor screw disposed in said separation zone.

C. a main screw keyed to said shaft and spaced above the conveyor screw in said tube to define a collection zone, said main screw receiving the paste from the inlet and working the paste to a predetermined degree to produce dough

which is discharged into said collection zone and picked up by the conveyor screw which advances the dough in the form of a coil through the separation zone; and

D. means to supply pressurized water to said perforations, whereby the coil of dough is subjected to water to dissolve the soluble components of the dough to produce a milky water, the resultant gluten and milky water being discharged from said outlet.

2. A system as set forth in claim 1, wherein said conveyor screw is provided with nozzles communicating with a bore, and means to supply pressurized water into said bore which is ejected through the nozzle to subject the inner surface of the coil to water to dissolve said soluble components.

3. A system as set forth in claim 1, wherein said inlet is defined by an annular slot in said tube surrounded by a toroid.

4. A system as set forth in claim 3, wherein said mixer to produce said paste includes a mixing screw rotating within a cylindrical chamber into which is fed said flour and water, the paste output of the chamber being supplied to said toroid.

5. A system as set forth in claim 1, wherein said main screw is axially shiftable relative to said shaft to lengthen or shorten the distance between said inlet and said collection zone and thereby vary the degree to which the paste is worked.

6. A system as set forth in claim 1, further including a water jacket surrounding the perforation in said tube to supply water thereto.

7. A system as set forth in claim 1, further including a wire mesh disposed below the tube to separate the gluten from the milky water.

8. A system as set forth in claim 8, wherein said wire mesh is a continuous belt of a driven conveyor.

US-PAT-NO: 3968268

DOCUMENT-IDENTIFIER: US 3968268 A
**See image for Certificate of Correction**

TITLE: Process for producing hydratable, translucent to glassy, proteinaceous products, and the resulting products

DATE-ISSUED: July 6, 1976


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
| Sair; Louis | Evergreen Park | IL | N/A | N/A |
| Quass; Donald W. | Evergreen Park | IL | N/A | N/A |


US-CL-CURRENT: 426/580, 426/104 , 426/455 , 426/506 , 426/646 , 426/656 , 426/802


ABSTRACT:

Process for preparing hydratable, proteinaceous food products involving: subjecting moist (e.g., crumbly to free-flowing), hydratable, proteinaceous food material having suitable moisture to elevated mechanical pressure and suitable temperature and pH conditions to convert the protein material under non-puffing conditions to a dense, substantially homogeneous, translucent to glassy, coherent, bonded, proteinaceous product of desired size and shape. The material is thereby bonded together so as to be capable of withstanding the disruptive deterioration and loss of structural identity caused by subjecting the proteinaceous material to retorting conditions such as used in food processing. The translucent to glassy, proteinaceous product yields hydrated food products having structural integrity and desired textural characteristics.


22 Claims, 0 Drawing figures

Exemplary Claim Number: 1

CLAIMS:

We claim:

1. The method of preparing an unpuffed, proteinaceous food product comprising subjecting water-moistened, edible proteinaceous material having at least about 40% by weight protein on a dry weight basis and an effective amount of water within the range of about 10 to 50% to working under effective mechanical pressure with added heat sufficient to convert it to a hot, moist, plastic extrudable mass and extruding said hot plastic mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions.

2. The method of claim 1 wherein said proteinaceous material comprises a member of the group consisting of soy protein material, wheat gluten, casein, rice gluten, and admixtures thereof.

3. The method of claim 1 wherein said proteinaceous material comprises soy

protein material.

4. The method of claim 1 wherein said proteinaceous material comprises wheat gluten.

5. The method of preparing an unpuffed, proteinaceous food product comprising subjecting water-moistened, edible proteinaceous material having at least about 40% by weight protein on a dry weight basis and an effective amount of water within the range of about 10 to 50% to working under effective mechanical pressure with added heat sufficient to convert it to a hot, moist, plastic extrudable mass and extruding said hot plastic mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, and said added heat includes the application of temperature conditions sufficiently high that the elongated die effects cooling of the advancing hot plastic mass before it leaves said die, thereby maintaining non-puffing conditions.

6. The method of claim 5 wherein said proteinaceous material comprises a member of the group consisting of soy protein material, wheat gluten, casein, rice gluten, and admixtures thereof.

7. The method of claim 5 wherein said proteinaceous material comprises soy protein material.

8. The method of claim 5 wherein said proteinaceous material comprises wheat gluten.

9. An edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, proteinaceous material in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, said extrudate product being produced by the method of claim 1.

10. An edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, proteinaceous material in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, said proteinaceous material comprising a member of the group consisting of soy protein material, wheat gluten, casein, rice gluten, and admixtures thereof, and said extrudate product being produced by the method of claim 1.

11. An edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, soy protein material in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, said extrudate product being produced by the method of claim 1.

12. An edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, wheat gluten material in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, said extrudate product being produced by the method of claim 1.

13. A subdivided, edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, proteinaceous material in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, and subdividing the extruded product, said extrudate product being produced by the method of claim 5.

14. A subdivided, edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, proteinaceous material in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, and subdividing the extruded product, said proteinaceous material comprising a member of the group consisting of soy protein material, wheat gluten, casein, rice gluten, and admixtures thereof, and said extrudate product being produced by the method of claim 5.

15. A subdivided, edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, soy protein material in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, and subdividing the extruded product, said extrudate product being produced by the method of claim 5.

16. A subdivided, edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, wheat gluten material in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, and subdividing the extruded product, said extrudate product being produced by the method of claim 5.

17. A food composition comprising (a) an edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, proteinaceous material having an effective amount of water within the range of about 10 to 50% in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product

characterized by having texture and retaining its structural integrity under retorting conditions, said extrudate product being produced by the method of claim 1 and (b) at least one other food product that is compatible with said extrudate of (a).

18. The composition of claim 17 wherein said component (b) comprises at least one other nutrient.

19. The composition of claim 17 wherein said component (a) is hydrated and in a subdivided form, and said component (b) comprises ground meat.

20. A food composition comprising (a) an edible, unpuffed, proteinaceous extrudate product having at least about 40% by weight protein on a dry weight basis prepared from extruding water-moistened, proteinaceous material having an effective amount of water in the range of 10 to 50% in the form of a hot, moist, plastic extrudable mass through and from a length of a temperature controlled, elongated die under non-puffing conditions to provide an unpuffed, substantially homogeneous, translucent to glassy, extruded product characterized by having texture and retaining its structural integrity under retorting conditions, said proteinaceous material having at least 40% by weight protein on a dry weight basis and comprising a member of the group consisting of soy protein material, wheat gluten, casein, rice gluten, and admixtures thereof, said extrudate product being produced by the method of claim 1 and (b) at least one other food product that is compatible with said extrudate of (a).

21. The composition of claim 20 wherein said component (b) comprises at least one other nutrient.

22. The composition of claim 20 wherein said component (a) is hydrated and in a subdivided form, and said component (b) comprises ground meat.

US-PAT-NO: 6001412

DOCUMENT-IDENTIFIER: US 6001412 A

TITLE: Method of making vital wheat gluten into layered fibers, apparatus therefor, and novel resulting textured and protein-denatured fiber products

DATE-ISSUED: December 14, 1999


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
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US-CL-CURRENT: 426/656, 426/578 , 426/62 , 426/622 , 99/367 , 99/368 , 99/373


ABSTRACT:

A method of and apparatus for transforming the clumped untextured putty-like and high viscoelastic adhesion physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering serated permanently textured fiber strand structure by mixing vital wheat gluten with grain flour and hydrating the mixture, and then appropriately appropriate shredding, steaming and hot moisture denaturation of the fiber protein, enabling the creation of moisture-absorbed textured wheat gluten analogs for ground meat fiber products, such as hamburger and the like.


16 Claims, 11 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

CLAIMS:

What is claimed is:

1. A method of permanently transforming clumped putty-like untextured mass and relatively high viscoelastic adhesion physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering textured fiber strand structure and forming the structure into a shape and texture simulating that of the layered fibers of one of meat and poultry, that comprises, intimately mixing flour with vital wheat gluten powder to interleave with and separate the gluten powder particles in a mixture; at substantially room temperature, hydrating the mixture to enable the absorption of water by the mixture to expand the gluten into a less viscoelastic mass; shredding the mass into a plurality of separated streams of elongated continuous fibers and dropping as a deposit upon a retaining surface; subjecting the deposit to heated moisture along the separate fibers within and throughout the deposit; continuing the application of heated moisture for a sufficient time for protein of the separate fibers within the deposit to become substantially denatured, to remove the bulk of the viscoelastic adhesion properties of the gluten; removing moisture from the deposit to produce a loose layered permanent fiber structure of relatively low retained viscoelasticity; and shaping the deposit

to simulate the appearance and texture of said meat or poultry to provide a wheat gluten analog thereof.

2. A method as claimed in claim 1 and in which a leavening agent is added to said mixture before completion of the hydrating.

3. A method as claimed in claim 1 and in which said shaping comprises forming the deposit into wheat-gluten analogs of one of meat and poultry pieces, chunks, ground product, patties, loaves and sausages.

4. A method as claimed in claim 3 and in which the analogs are formed as vegetarian no-fat analogs.

5. A method as claim in claim 3 and in which one of ethnic flavorings, spices and meat and poultry flavors are added to the deposit.

6. A method as claimed in claim 1 and in which the shaping precedes the application of heated moisture.

7. A method as claimed in claim 6 and in which the shaping is in the form of patties.

8. A method as claimed in claim 7 and in which the patties are deposited upon and restrained by a moving belt or screen having openings, with the patties sticking and locking about the openings as they are subjected to the heated moisture, creating a permanent external texturizing pattern on the patties with the pattern defined by the openings.

9. A method as claimed in claim 1 and in which the deposits are deposited upon and restrained by a moving openings-provided belt with the deposits sticking and locking onto the belt openings as they are subjected to the heated moisture.

10. Apparatus for transforming clumped putty-like untextured mass and relatively high viscoelastic adhesion physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering textured fiber strand structure and forming the structure into a shape and texture simulating that of the layered fibers of one of meat and poultry, and receiving flour mixed with vital wheat gluten powder to interleave with and separate the gluten powder particles in a mixture at substantially room temperature, hydrating the mixture to enable the absorption of water to expand the gluten into a less viscoelastic mass; means for shredding the mass into a plurality of separated streams of elongated continuous fibers, dropping as a deposit upon a retaining surface; means for subjecting the deposit to heated moisture along the separate fibers within and throughout the deposit; means for continuing the application of heated moisture for a sufficient time for protein of the separate fibers within the deposit to become substantially denatured, to remove the bulk of the viscoelastic adhesion properties of the gluten; means for removing moisture from the deposit to produce a loose layered permanent fiber structure of relatively low retained viscoelasticity; and means for shaping the deposit to simulate the appearance and texture of said meat or poultry to provide a wheat gluten analog thereof.

11. Apparatus as claimed in claim 10, and in which the shaping means is deposed after the shredding means and before the heated moisture subjecting means.

12. Apparatus as claimed in claim 11 and in which the shaping means produces successive cylindrical shapes.

13. Apparatus as claimed in claim 10 and in which a moving openings-provided belt is disposed to receive the deposits and to restrain the same against movement as they are carried to and through the heated moisture, with the deposits on the belt locking into the belt openings.

14. Apparatus as claimed in claim 13 and in which the belt is of screen form.

15. A wheat gluten analog for pieces, patties, loaves and sausages of ground meat or poultry consisting of loose layers of moisture-absorbed and swelled elongated fiber strands of heat-denatured vital wheat gluten.

16. A method of permanently transforming clumped putty-like untextured mass and relatively high viscoelastic adhesion physical and chemical properties of hydrated vital wheat gluten into a loose layered minimally adhering textured fiber strand structure and forming the structure into a shape and texture simulating that of the layered fibers of one of meat and poultry, that comprises, intimately mixing flour with vital wheat gluten powder to interleave with and separate the gluten powder particles in a mixture; at substantially room temperature, hydrating the mixture to enable the absorption of water by the mixture to expand the gluten into a less viscoelastic mass; shredding the mass into streams of fibers and depositing the same upon a retaining surface; shaping the deposits to simulate the appearance of meat or poultry products; carrying the shaped deposits upon and restrained by a moving openings-provided belt or screen, with the shaped deposits sticking and locking into the openings; subjecting the deposits to heated moisture as they are carried by the belt or screen and for a sufficient time for protein of the separate fibers within the deposits to become substantially denatured, to remove the bulk of the viscoelastic adhesion properties of the gluten, while creating permanent external texturing of the deposits with the pattern defined by the openings; and removing moisture from the deposit to produce a loose layered permanent fiber structure of relatively low retained viscoelasticity simulating the appearance of said meat or poultry products to provide a wheat gluten analog thereof externally patterned with said pattern.

US-PAT-NO: 4269766

DOCUMENT-IDENTIFIER: US 4269766 A

TITLE: Method and apparatus for fractionating the whole wheat kernel by sequential milling

DATE-ISSUED: May 26, 1981


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|---|---|---|---|---|
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US-CL-CURRENT: 530/374, 426/436 , 426/479 , 426/484 , 426/518 , 530/375


ABSTRACT:

A process for fractionating the whole wheat kernel into its gluten, starch and bran-germ components including the steps of tempering the whole wheat kernel in water to increase its moisture content, flaking the tempered wheat kernel, disintegrating the flakes to a particle size range such that 20% to 90% of the particles will be retained on a 30 mesh U.S. Standard screen and in a manner that the resulting bran-germ particles are larger than the resulting endosperm particles, hydrating and agitating the kernel particles to just saturate them and to form a thick, dough-like mass and subjecting the mass to tumbling and/or manipulation together with water washing to separate and recover the gluten, starch and bran-germ components of the kernel.


19 Claims, 2 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 2

CLAIMS:

What is claimed is:

1. A process for fractionating the whole wheat kernel into its gluten and non-gluten endosperm components comprising the steps of:

a. tempering whole wheat kernels in water to a moisture content, by weight, in the range from 14% to saturation;

b. flaking the whole sheat kernels to a flake thickness in the range from 0.0005 to 0.025 inches;

c. milling the flakes into primarily bran-germ and endosperm particles, and bran-germ particles being larger than said endosperm particles, and said bran-germ and endosperm particles having a size distribution such that 20 to 90% by weight of the particles are retained on a 30 mesh U.S. Standard screen;

d. hydrating said particles in an additional quantity of water ranging from 65 to 85% by weight of said particles to be hydrated and in an amount just sufficient to achieve a saturation moisture content and agitating the particles

and water to form a thick, dough-like mass;

e. water washing a major proportion of said non-gluten endosperm components from said dough-like mass to leave a primarily gluten-containing agglomerate; and

f. separating and recovering vital wheat gluten from said agglomerate.

2. A process, as claimed in claim 1, wherein said wheat kernels are tempered to a moisture content of from 14 to 22% by weight.

3. A process, as claimed in claim 2, wherein said wheat kernels are tempered to a moisture content of from 14 to 18% by weight.

4. A process, as claimed in claim 1, wherein said bran-germ and endosperm particles have a size distribution following milling such that 30-70% of the particles are retained on a 30 mesh screen.

5. A process, as claimed in claim 1, wherein said bran-germ and endosperm particles have a size distribution following milling such that 40-60% of the particles are retained on a 30 mesh screen.

6. A process, as claimed in claim 1, wherein said particles are hydrated by mixing said particles with water to form a dough, kneading said dough and permitting said hydrating water and particles to be associated in said dough for a time sufficient to substantially completely hydrate said particles.

7. A process, as claimed in claim 6, wherein said time sufficient to substantially completely hydrate said particles ranges from about 10 to 60 minutes.

8. A process, as claimed in claim 1, wherein said dough-like mass is gently tumbled during water washing of said non-gluten endosperm components therefrom.

9. A process, as claimed in claim 1, wherein said non-gluten endosperm components are retained in the wash water and are continuously transferred away from said dough-like mass.

10. A process, as claimed in claim 1, wherein said non-gluten endosperm components are retained in the wash water and are separated from the dough-like mass by filtration.

11. A process, as claimed in claim 10, wherein said non-gluten endosperm components are filtered from said dough-like mass in at least two separate stages.

12. A process, as claimed in claim 1, wherein said vital wheat gluten is separated from said agglomerate by mechanically manipulating said agglomerate while washing said agglomerate with water to wash said non-gluten components of said agglomerate away from said gluten.

13. A process, as claimed in claim 12, wherein siad non-gluten components of said agglomerate include starch and bran-germ.

14. A process as claimed in claim 13, wherein said bran-germ is separated from said agglomerate by abrading the agglomerate with a roughened surface.

15. A process, as claimed in claim 1, including the additional step of drying the gluten after separation thereof from said agglomerate.

16. A process, as claimed in claim 1, wherein said water for water washing said dough-like mass is at a temperature in the range 60.degree.-90.degree. F.

17. A process for fractionating the whole wheat kernal into its gluten, non-gluten endosperm and bran-germ components commprising the steps of:

a. tempering whole wheat kernels in water having a temperature in the range from about room temperature to 120.degree. F. to a moisture content, by weight, in the range from 14 to 22%;

b. flaking the whole wheat kernels to a flake thickness in the range from 0.0005 to 0.025 inches;

c. milling the flakes into primarily bran-germ and endosperm particles, said bran-germ particles being larger than said endosperm particles, and said bran-germ and endosperm particles having a size distribution such that 20 to 90% by weight of the particles are retained on a 30 mesh U.S. Standard screen;

d. hydrating said particles in an additional quantity of water ranging from 65 to 85% by weight of said particles to be hydrated and in an amount just sufficient to achieve a saturation moisture content to form a thick, dough-like mass, said hydrating comprising mixing said particles with water to form said dough, kneading said dough and permitting said hydrating water and particles to be associated in said dough for about 10-60 minutes;

e. separating a major proportion of said non-gluten endosperm components from said dough-like mass to leave a primarily gluten containing agglomerate by water washing said dough-like mass in water having a temperature in the range 60.degree. to 120.degree. F. while subjecting said mass to gentle tumbling, said non-gluten endosperm components being retained in the wash water and separated from said dough-like mass by filtration;

f. separating said vital wheat gluten from said agglomerate by mechanically manipulating said agglomerate while washing said agglomerate with water having a temperature in the range 60.degree. to 120.degree. F. to wash said non-gluten components of said agglomerate from said gluten, said mechanical manipulating including abrading the agglomerate with a roughened surface to separate said bran-germ therefrom.

18. In a process for fractionating the whole wheat kernel into its components including the steps of tempering the whole wheat kernels in water to a moisture content, by weight, in the range from 14% to saturation, milling the whole wheat kernels to flakes having a thickness in the range from 0.0005 to 0.025 inches, hydrating the milled kernels in an amount of water just sufficient to achieve a saturation moisture content to form a thick, dough-like mass, and separating the gluten and non-gluten kernel components from the dough-like mass, the improvement comprising

milling said flakes prior to hydrating to disintegrate said flakes into primarily bran-germ and endosperm particles, said bran-germ particles being larger than said endosperm particles, and said bran-germ and endosperm particles having a size distribution such that 20 to 90% by weight of the particles are retained on a 30 mesh U.S. Standard screen.

19. A process, as claimed in claim 18, wherein said bran-germ and endosperm particles have a size distribution following flake disintegration such that 30-70% of the particles are retained on a 30 mesh screen.

US-PAT-NO: 4125528

DOCUMENT-IDENTIFIER: US 4125528 A

TITLE: Method for fractionating the whole wheat kernel by centrifugal means

DATE-ISSUED: November 14, 1978


INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
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| Shoup; Floyd K. | Hutchinson | KS | N/A | N/A |


US-CL-CURRENT: 530/374, 127/67 , 127/69 , 426/436 , 426/479 , 426/484 , 426/518 , 530/375


ABSTRACT:

A process for fractionating the whole wheat kernel into its gluten, starch and bran-germ components including the steps of tempering the whole wheat kernel in water to increase its moisture content, milling the tempered kernel to reduce the particle sizes of the kernel components, forming a homogeneous slurry of the particles and water, the wheat to water ratio of the slurry being in the range 1:3 to 1:10, by weight, vigorously admixing the slurry to achieve uniform dispersion of the particles in the water, applying centrifugal forces to the slurry to cause it to separate into its gluten, starch and water phases, separating the gluten and starch phases and purifying them by conventional techniques to recover gluten, starch and bran-germ in very high yield fractions.


17 Claims, 1 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

CLAIMS:

What is claimed is:

1. A process for fractionating the whole wheat kernel to separate at least starch and gluten and to recover at least vital wheat gluten therefrom, comprising the steps of:

a. tempering whole wheat kernels in water to a moisture content, by weight, in the range from 14% to saturation;

b. milling the tempered kernels to particulate form;

c. admixing said kernel particles with water and agitating said mixture to form a substantially homogeneous slurry in which said starch and gluten particles are dispersed, said slurry having a wheat to water ratio, by weight, of 1 part wheat to 3 or more parts water;

d. subjecting said slurry to centrifugal forces sufficient to cause said

slurry to separate into a primarily starch-containing phase, a supernatant, primarily gluten-containing phase and a primarily water phase, said gluten-containing phase containing agglomerated gluten;

e. separating said supernatant agglomerated gluten-containing phase from said other phases; and

f. recovering vital wheat gluten from said agglomerated gluten-containing phase.

2. A process, as claimed in claim 1, further including the step of recovering starch from said starch-containing phase.

3. A process, as claimed in claim 1, wherein said wheat kernels are tempered to a moisture content of from 14 to 22% by weight.

4. A process, as claimed in claim 1, wherein said wheat kernels are tempered to a moisture content of from 14 to 18% by weight.

5. A process, as claimed in claim 1, wherein said slurry has a wheat to water ratio in the range 1:3 to 1:10.

6. A process as claimed in claim 5, wherein said slurry has a wheat to water ratio of about 1:5.

7. A process, as claimed in claim 1, wherein said slurry is subjected to centrifugal forces in the range of 25G to 75G.

8. A process, as claimed in claim 1, wherein said supernatant glutencontaining phase is separated from said starch-containing phase by said water phase.

9. A process, as claimed in claim 1, wherein said gluten in said gluten-containing phase is caused to agglomerate during centrifugation.

10. A process, as claimed in claim 1, wherein vital wheat gluten is recovered from said agglomerated gluten-containing phase by mechanically manipulating said agglomerate while washing said agglomerate with water to wash non-gluten components of said agglomerate away fron said gluten.

11. A process, as claimed in claim 10, wherein said non-gluten components of said agglomerate include starch and bran-germ.

12. A process, as claimed in claim 11, wherein said bran-germ remaining in said agglomerate following washing is separated therefrom by abrading the agglomerate with a roughened surface.

13. A process, as claimed in claim 1, including the additional step of drying the gluten after recovery from said gluten-containing phase.

14. A process, as claimed in claim 1, including the step of separating bran-germ particles from said slurry prior to subjecting said slurry to centrifugal forces.

15. A process, as claimed in claim 14, wherein said bran-germ particles are separated from said slurry by filtering said slurry, said bran-germ particles being retained on said filter.

16. A process, as claimed in claim 14, including the step of recovering said separated bran-germ particles.

17. A process for fractionating the whole wheat kernel into its components to recover starch, gluten and bran-germ, comprising the steps of:

a. tempering whole wheat kernels in water having a temperature in the range from about room temperature to 120.degree. F. to a moisture content, by weight, in the range from 14 to 22%;

b. milling the tempered kernels to particulate form;

c. admixing said kernel particles with water and agitating said mixture to form a substantially homogeneous slurry in which said starch and gluten particles are dispersed, said slurry having a wheat to water ratio, by weight, in the range 1:3 to 1:10;

d. subjecting said slurry to centrifugal forces in the range 25G to 75G to cause said slurry to separate into three phase, a primarily starch-containing phase, a primarily gluten-containing phase containing agglomerated gluten, and a primarily water phase;

e. separating said gluten-containing and starch-containing phases;

f. recovering vital wheat gluten from said gluten-containing phase by mechanically manipulating said agglomerate while washing said agglomerate with water having a temperature in the range 60 to 120.degree. F. to wash bran-germ and starch away from said gluten, said mechanical manipulating including abrading the agglomerate with a roughened surface to separate said bran-germ therefrom;

g. drying said gluten;

h. recovering starch from said starch-containing phase; and

i. recovering bran-germ from said gluten agglomerate wash water.